

NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA



THESIS

**PRICING INFORMATION
SERVICES IN ELECTRONIC MARKETS:
CASE STUDY OF DECISIONNET**

by

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March, 1996

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**PRICING INFORMATION
SERVICES IN ELECTRONIC MARKETS:
CASE STUDY OF DECISIONNET**

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of the requirements for the degree of

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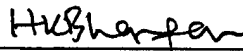
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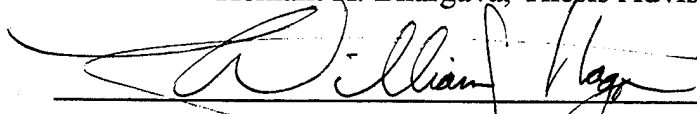


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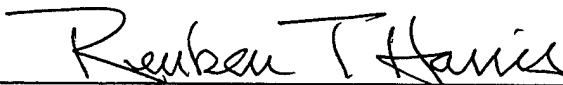
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ABSTRACT

The Internet has experienced rapid growth since its beginning as a government-funded communications network. This growth has partially contributed to the explosion of commerce on the net. One example of services offered on the Internet is DecisionNet. It provides an electronic environment of decision support and modeling technologies. The purpose of this thesis is to design an equitable pricing scheme for those on-line information service providers. DecisionNet is used as a case study to describe the pricing policies.

Service pricing over the Internet is still in its infancy. As a result there is not one set model for pricing Internet services that can directly be applied to applications such as DecisionNet. The pricing strategy should be based both on pricing theory and industry practices (pertaining to services). This thesis has taken this approach. Research was also conducted on the United States Government's acquisition process. This was necessary because the government is expected to be a major consumer of on-line information services.

This thesis has proposed a simple yet effective pricing policy which is designed to recoup both the fixed and the variable costs associated with providing information services over the Internet. The policy is based on the strategy of market segmentation. The segments have been broken into four areas and further subdivided based on numbers of users and level of usage. Suggestions have also been made in regards to how to recoup both the fixed costs and the variable costs.

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I. INTRODUCTION

A. PURPOSE

The Internet has experienced rapid growth since its beginning as a government-funded communications network in the 1960's. It is used by both the public and the private sectors in the United States and, in fact, the world. The potential for both commerce and education on the Internet is virtually unlimited. Several issues have developed as a result of the rapid growth of new uses and users on the *Information Superhighway*. Two of those issues are closely related. The first involves how to control congestion of the Internet. The second encompasses what method of pricing should be applied to both the services offered on the net and the net's access and usage. This thesis addresses the second issue.

Specifically, the purpose of this thesis is to design an equitable pricing scheme for information services on the Internet. This thesis uses DecisionNet as a case study to investigate price schemes for information service providers on a global network. It is also used to show what considerations must be addressed by any entity that provides similar services over the net.

I chose to follow a case study format to present a pricing scheme for providers of on-line information services. DecisionNet was chosen as the example entity for three main reasons. First, DecisionNet is entering a marketplace that has not been fully developed. This has allowed me an opportunity to develop a pricing policy without any preconceived notions of what is the correct method to use. Not being stuck in any one paradigm also gives me the freedom to be creative and to develop a pricing policy that meets the two main criteria that I stress throughout this thesis: Any pricing scheme should be equitable to all parties involved and that the policy should be easy to understand and to recreate. The second reason that DecisionNet was chosen as a case study dealt with the fact that it was being developed at Naval Postgraduate School Monterey, California. The individuals were easily available to answer questions and to provide ideas. The last reason for its

selection revolves around the fact that the idea of DecisionNet is still in its infancy. An idea or initial concept can change considerably during its development. The newness of the idea has allowed me the freedom to make certain assumptions (see Chapter V) throughout the process. These assumptions have enabled me to develop a general pricing policy for information networking applications such as DecisionNet.

B. DECISIONNET (BACKGROUND)

Bhargava (1995), spells out driving forces behind DecisionNet, the providers of the software, the users of the system, and the technology behind the system. The continued growth of the Internet virtually ensures that businesses like DecisionNet will become more common in the future.

DecisionNet is an electronic environment of decision support and modeling technologies delivered over a distributed global network such as the World Wide Web (WWW). Decision technologies offered under DecisionNet include decision support and modeling software. That software typically uses decision analysis, operations research (OR), and management science (MS) methods that consist of four kinds of resources: data, models, solvers, and decision support packages. DecisionNet exploits the connectivity of the Internet and the WWW.

Consumers of DecisionNet's services [will] include faculty involved in research in models and algorithms, OR/MS practitioners, educators and students, [government agencies, government contractors] as well as many non-OR/MS people who have access to the WWW. For example, a practitioner who has formulated a model but does not have a suitable solver may use DecisionNet to execute the model remotely using a server that does have such an solver. A researcher doing computational testing of a new algorithm could use DecisionNet to obtain data sets for testing the algorithm as well as to remotely execute other known algorithms. Educators could use DecisionNet to demonstrate a variety of models and algorithms. Similarly, a less expert user faced with a well-understood problem may use DecisionNet to select a suitable model, solver, data and/or a decision support package, for solving that problem.

Under DecisionNet, providers of these technologies--those responsible for developing and maintaining them--would provide a platform for the remote execution of these technologies. A virtual library of such technologies would be created and organized in a distributed network, with centralized access being provided by DecisionNet. These technologies, or services, would be obtained by

consumers--perhaps for a fee--over the WWW. DecisionNet would facilitate providers in setting up, and being compensated for the use of their technologies. It would facilitate consumers in searching for, selecting, and obtaining (or executing), appropriate services. (Bhargava, 1995)

The previous paragraphs allude to just one way in which services offered by applications such as like DecisionNet could be used. There are *potentially three different* ways that a user could gain benefit from using this type of information service.

- The first use of DecisionNet, as previously described, will provide users an opportunity to gain access to *executable* model, solver, data and/or decision support packages for solving problems.
- The second type potential use involves DecisionNet being used as an *advertizing* platform for the software providers. It would allow the providers an additional method to advertise their products and for potential consumers to gain awareness of the products.
- The third and final type of usage would be for consumers to gain a low cost opportunity to *evaluate* the latest software applications available on the market.

The latter would provide the consumers an opportunity to test run applications before buying them. This thesis will address the pricing scheme for the first potential use of the system. However, the information provided will assist the price-setters in pricing the latter two types of potential use.

This thesis addresses the pricing of information services like DecisionNet's from an accounting, economic, and marketing point of view. It has specifically looked at the costs associated with providing services on-line. Questions have been addressed as to the relevancy of those costs in the determination of a pricing scheme. Recommendations have also been made with respect to categorizing the costs and determining which will play a part in the short term pricing method to be employed. The marketplace is also evaluated and suggestions are made in regards to market segmentation. Finally, I state how applications such as DecisionNet should price their services.

C. INITIAL IMPRESSIONS

On the surface, the issue of pricing appears to be relatively simple. However, when one considers the marketplace and the other external factors involved, one realizes that there is significantly more involved in pricing than just the costs incurred by the selling agent and his desired rate of return. This thesis attempts to look at the pricing issue from several different view points. This is necessary to design a well thought out pricing scheme. It shows that one needs to consider several factors when pricing a service or a product. The thesis also addresses some pricing issues which are specific to the *Information Superhighway*.

D. METHODOLOGY

The research for this thesis has involved an Internet and library search of service and product pricing (from an accounting, economic and marketing perspective), Internet economics, government contracting, market segmentation, and electronic publishing. Specific industries (airlines, on-line service companies, and phone companies) have also been studied to determine how they price their products and services. Several interviews were conducted to gain some additional insight toward the most current approaches to cost recovery and pricing mechanisms in the following fields: economics (charge back, an information service cost recovery method), adaptive data processing equipment acquisition, government contracting, and library research services.

E. BASIC ASSUMPTION

A company's pricing policy is influenced by several factors. One major factor that affects pricing is how the company is incorporated. Is the company for-profit or not for-profit? To narrow the scope of this thesis, a basic assumption has been made regarding

this factor. This thesis has been written as if DecisionNet will be incorporated as a for-profit enterprise. DecisionNet may, in fact, become a nonprofit organization. This assumption has been necessary to enable more concrete suggestions to be made about how a company should address the pricing of its services.

F. SUMMARY OF CHAPTERS

Chapter II addresses how on-line information services companies can provide a needed service to the United States Government that is not currently being provided. This chapter also suggests policies that can be implemented by those companies which will make the acquisition process go more smoothly and reduce the workload of all parties involved.

Chapter III discusses some major considerations behind the pricing of a product or service. It first describes the need for defining the business objective behind a pricing strategy. This is followed by a brief overview of how the academic areas of accounting, economics, and marketing view pricing. Next, the concept of average costing is defined and then broken down into its two variants full and variable costing. This is followed with an introduction of the concept of scarce resources and how it applies to pricing. The three academic fields are again revisited to address their approaches to pricing. The next section addresses market segmentation and price discrimination and how these strategies can be used to a company's advantage. Finally, recommendations are made suggesting how these pricing theories should be applied to the example company, DecisionNet.

Chapter IV addresses current pricing mechanisms and their related pro's and con's. This chapter reviews the current debate over how the Internet should be priced. The next section reviews charge back as it relates to a cost recovery system for computer services. The chapter then touches on how several different business categories (similar to DecisionNet) price their services (on-line providers, telephone companies and the airline industry). Next, the issue of electronic publishing is discussed with emphasis on how to

recover the high cost of first copy production. Comparisons are then made between these subjects and DecisionNet.

Chapter V addresses how DecisionNet should set up its pricing structures. The chapter begins by generally describing the costs that DecisionNet would face. Those costs are then broken down into two categories: (1) fixed and (2) variable. A suggestion is then made about whether or not DecisionNet should segment its marketplace. This section is followed by a review of the basic assumptions made throughout this thesis. The chapter ends by detailing the pricing schemes that DecisionNet should use to recover its cost and to provide a return for its investors.

Chapter VI, the final chapter begins with a summary of the main points brought out in this thesis. Next, suggestions are made regarding the contributions that this thesis has made to on-line information service pricing and what lessons have been learned during its development. This chapter concludes by addressing areas that will require further research.

Three appendices have been included to give the reader additional information about the United States Government acquisition process. Companies that conduct business with the United States Government need to be familiar with this information to more effectively navigate the contracting process of the government. Appendix A is designed to give an overview of the procedures involved in a government acquisition of automated data processing equipment (ADPE). Appendix B gives a synopsis of the legislation, regulations, directives, and overseeing organizations involved in the acquisition process. Finally, appendix C gives a synopsis of the different types of contracts that the United States Government can enter into.

II. GOVERNMENT'S USE OF ONLINE INFORMATION SERVICES

A. THE BENEFITS OF THE U.S. GOVERNMENT'S USE

Entities like DecisionNet will provide services that are needed and currently do not exist. The services offered by these companies will lower the costs that the federal government currently pays for many services it acquires. This will be done in two distinct ways.

- Directly. The United States Government is constantly making complicated decisions that require the analysis of multiple variables. These decisions lend themselves to a computer aided solution. The government has only a few options for filling this need. Some options are included in the following list:
 - Buy commercial-of-the-shelf software (if it is available).
 - Contract out to have the software developed.
 - Use in-house experts to develop the software (if they are available).
 - Decide without the aid of the software.

DecisionNet will offer the government and others the additional low cost practical alternative of leasing or renting the service.

- Indirectly. Today, if a company requires the use of modeling or decision support technology to provide a service to the federal government, it has to use one of the conventional methods mentioned above. The cost associated with that method is then transferred to the department or agency contracting with that company. When DecisionNet goes on-line, it will offer these services at a substantial savings to the vendor. This cost savings will in turn be passed on to the United States Government in the form of a reduced fee for the originally contracted service.

B. SIMPLIFYING THE ADPE ACQUISITION PROCESS

The government's ADPE acquisition process is complicated (see Appendix A). However, DecisionNet can make some choices that will reduce the amount of the work required to be completed by all parties involved. The following list gives some suggestions that DecisionNet should consider when setting up its service. This list is based on research that has been compiled and placed in Appendices A-C:

- *Keep the price charged for services and their associated contracts below the \$2,500.* As the cost of a service increase so does the number of procedures and the work associated with the contract for that service. If DecisionNet can keep the cost for its service below the \$2,500 threshold, the company can limit most of the work required by the government to set up the contract.
- *Complete the steps required to become approved, by the General Services Administration (GSA), for a Multiple Award Service Contract (MAS) contract.* The GSA issues a guide that addresses the use of the GSA's multiple award schedule contracts for federal information processing (FIP) resources. The guide explains when one can use MAS contracts and how to use them. It addresses how a government agency can find vendors that have schedule contracts. It also explains how to obtain assistance from GSA for using the FIP MAS contracts. (GSA FIP Resource, 1995) If an agency's need can be filled by using a MAS contract, it can reduce the steps involved in the acquisition process. The project manager (PM) and the contracting officer (CO) are still required to complete the planning phase of the acquisition process (specifically the requirements and the alternatives analysis). The need must be accurately filled by the MAS contract. The GSA has already completed the remaining steps required to authorize the contract and to ensure that all appropriate laws, regulations and directives have been followed. (Stone, 1995)

- *Charge a flat fixed fee for the service and enter fixed fee contracts vice variable or cost plus contracts.* A fixed fee contract offers the least amount of risk to the government. They are also easier to administer, budget, and obligate funds for.
- *Limit the contracts to less than one year and make the contract renewal process simple.* Most cost centers receive allowances or allotments of money that has a life of one year. When a cost center enters a contract, which involves money from its Operations and Management account, the center needs to be able to obligate that money during the year that it receives the money.
- *Ensure that the invoice includes the following information:*
 - The name of the contractor
 - An invoice number and invoice date
 - Contract/purchase order number, or other authorization for delivery of property of services,
 - Description, price, and quantity of property and services delivered or rendered,
 - Shipping and payment terms,
 - Other substantiating documentation or information as required by the contract,
 - Name where practicable, title, telephone number, and complete mailing address of the responsible official to whom payment is to be sent. (Practical Comptrollership, 1995)

With the above information on an invoice the government can pay the bill when it arrives. If this information is not on the invoice, the invoice will be returned and the vendor will have seven days to send an invoice with the proper information available on it.

C. CONCLUSION

DecisionNet will offer a service that will fill a United States Government need. Over the years the government has developed a large bureaucracy that covers the types of

services that DecisionNet will be offering. This bureaucracy has made the government's acquisition process complicated. The price-setters at DecisionNet need to be familiar with this process so that they can reduce the work required to interface with the government and to make DecisionNet more attractive to this customer base.

The next chapter, chapter III, will discuss pricing theory from the perspective of accounting, economics, and marketing. This step is necessary so that one can gain a basic understanding of the pricing theory that has become the basis of the policies that are currently being implemented in industry.

III. PRICING THEORY

A. BUSINESS OBJECTIVE

Oxenfeldt (1961) states that the first step to setting a price for a service is to decide the business objective. A company may choose any one of several different objectives when establishing the price of a service. The following is a list of possible objectives:

- Maximize immediate profit.
- Maximize long-run profit
- Obtain a given return on investment.
- Minimize profits of competitors.
- Minimize risk of excessive losses.
- Obtain a greater share of the market.
- Strengthen the position of management. (Oxenfeldt, 1961)

Determining the business objective gives a company a framework for developing the best pricing strategy to meet that objective. Different objectives will lead to different prices for that service. Much of the literature evaluates pricing from the standpoint of maximizing long term profit. (Bruegelmann, 1986, Oxenfeldt, 1961)

B. ACADEMIC FIELDS

There are three main academic fields involved in the study of how to price a service. They are the fields of accounting, economics and marketing. (Bruegelmann, 1986) These areas view the pricing differently. The accounting profession takes a cost-oriented approach. Cost and managerial accountants are mainly concerned with the proper allocation of the costs incurred in the development and the delivery of a service. Economics is mainly concerned with the marginal analysis of a service. It emphasizes the costs directly associated with the production of an additional unit or the serving of an additional customer. All costs incurred before this point are considered sunk. They are

generally not considered relevant to the price that should be charged for the next unit sold. Marketing is more market-oriented than cost-oriented. It emphasizes the value of the service to the consumer considering demand intensity and customer psychology. The approaches of each discipline will be discussed later in this chapter after the concepts of average costing, marginal costing and scarce resources have been introduced.

C. AVERAGE COSTING

Many books on pricing recommend the use of some variant of average costing or cost-plus pricing in the development of a pricing strategy for a service. (Bruegelmann, 1986, Oxenfeldt, 1961, Samuelson, 1992) "Cost-plus is a method of establishing a price that maintains a constant margin between the base cost and the price." (National Industrial Conference Board, 1958) Textbooks differ as to which type of average cost method to use. They also do not agree about what else should be considered in the pricing decision.

The average cost method can be further broken down into two types: (1) full costing and (2) variable or marginal costing.

1. Full Cost Method

The full cost method is often called absorption costing. This cost method is an approach to service costing that assigns a representative portion of all costs to an individual service. (Needles, 1981) Full costing allocates all of the costs incurred throughout the firm.

a. Advantages and Concerns Involving the Full Cost Approach

The main advantage to pricing based on full cost is that it recognizes the importance of capacity costs by including fixed overhead and, therefore, will result in prices that cover all costs. (Samuelson, 1992) A manager helps to guarantee the long term

existence of a company, by ensuring that all of the costs incurred by a company are included in or at least considered during the pricing decision. Several concerns have arisen from the use of the full cost approach. The following list addresses the concerns associated with this method:

- The economist's argue those full-cost figures developed by accountants include irrelevant sunk costs. (Hewitt, 1967)
- The accounting practices and conventions regarding the allocation of cost for expenses such as depreciation are questionable. There is a tendency of the price-setter to miscalculate costs in both full and variable average cost methods. This is most evident with the full cost approach due to the difficulty of correctly allocating the fixed costs. (Davidson, 1978)
- There is an apparent "... circularity in pricing decisions when the [full] cost based approach is use. The per-unit cost of a product is directly affected by the number of units produced. As the number of units is increased, the amount of fixed costs allocated to each unit decreases. Thus, the per-unit cost of a product if 50,000 units are produced is different from when 60,000 units are produced. The number of units produced and sold, however is affected by the price set. The quantity sold can be increased only if the price is decreased. Thus, price is related to per-unit costs, per-unit costs are related to volume and volume is related to price." (Davidson 1978)
- "Full-cost pricing uses [the] average cost [method]--the incorrect measure of relevant cost-- as its base. The logic of marginal analysis in general and the optimal markup rule in particular show that optimal price and quantity depend on marginal cost. Fixed costs, which are counted in AC [average cost referring to full cost approach] but not in MC [referring to the marginal cost approach], have no effect on the choice of optimal price and quantity. Fixed costs obviously are important for the decision about whether or not to produce the good. For production to be profitable in the

long run, price must exceed average cost [full cost approach]. If not, the firm should cease production and shut down. Thus, to the extent that AC differs from MC, the full-cost method can lead to pricing errors.”

(Samuelson, 1992)

- “The percentage markup should depend on the elasticity of demand. There is considerable evidence that firms vary their markups in rough accord with price elasticity. In evaluating the practice of full-cost pricing, the real issue is how close it comes to duplication of optimal markup pricing. Even if firms do not apply the optimal markup rule, they may price as though they did. In some circumstances, full-cost pricing is a ‘lower-cost’ alternative to the optimal markup rule. Estimating the price elasticities necessary for setting optimal markups is sometimes very costly. Accordingly the firm may choose to continue its current pricing policy (believing it to be approximately optimal) rather than generating new and costly elasticity estimates and setting a new markup.” (Samuelson, 1992)

2. Variable Cost Method

This cost method addresses only those additional costs associated with the production of one additional unit of output. This method separates the fixed, sunk, or long term cost from the variable costs or short term costs involved in providing a service. Those variable costs are then used in the pricing decision. This is done to facilitate an incremental analysis that is generally used by a company to make short-run pricing decisions. Fixed costs are those costs that the management does not have control over and are incurred regardless of whether the company operates in the short term. An example of a fixed cost might be rent on a building housing the company’s equipment. Variable costs are those costs that change in direct proportion to productive output or any other volume measure. An example of a variable cost is raw materials.

a. Advantages and Concerns Involving the Variable Cost Approach

The main advantage of the variable cost method is that it helps management in its short term pricing decisions. This is done by letting them know the price necessary to cover those cost that management can immediately control. If that price exceeds the price that the consumers are willing to pay, then management will be incurring additional losses that are directly associated with the additional production. Management does have the option of stopping production. This will limit the company's losses to the fixed costs. The following list addresses the concerns involved with the variable cost method:

- Economists argue that pure variable costing does not give enough attention to the intensity of demand and consumer behavior (Hewitt, 1967, Oxenfeldt, 1961)
- Variable costing may lead to underpricing and will force a company out of business in the long run (Samuelson, 1992).

D. SCARCE RESOURCES

One basic principle of economic theory revolves around the allocation of scarce resources. Clarke (1993) in his paper titled "AARNet Economics: How to Avoid Cooking the Golden Goose" describes this micro-economic principle. Scarce resources are most efficiently allocated in circumstances in which the price is set in a marketplace of informed purchasers. To be efficiently allocated, the people who make the allocation decisions need to enjoy the benefits and suffer the costs. This is ensured by the principle of user-pays. Rational decision-makers will only use goods and services which have a marginal benefit to them. Wasteful goods and services will not be purchased and resources will be used efficiently. In a perfect market, the price balances supply and demand.

Generally, the American price-setter's motivation is profit (Nagle, 1987). His purpose of pricing is to produce as high a margin as practicable between revenue and costs. Occasionally charging a lower amount than that previously proposed may be advantageous for the price-setter. This may happen when the organization offers many different goods or services. The service offered for less than its costs is called a loss-leader. The loss-lead is designed to attract customers into the place of business in the hopes that the customers will also purchase an additional good or service.

E. ACADEMIC FIELDS REVISITED

As previously mentioned, each field approaches pricing from a different perspective. The following sections review the findings from Bruegelmann's (1986) research. His research addressed how the three different fields of thought (accounting, economics, and marketing) approached price and how businesses apply the different pricing theories.

1. Accounting

Cost accounting refers to the determination and control of costs. The cost accountant is concerned with the costs of manufacturing products and with the expenses of selling and distributing the products. It is important that the cost accountant collect, assemble, and interpret data in a way that helps management to assess current operations and plan for the future. (Needles, 1981) Cost and management accounting textbooks recommend the use of variable costing in short-run pricing decisions. In the long run, prices must be set to enable the recovery of total costs plus a satisfactory return to the investors.

2. Economics

Economics textbooks state "the microeconomic theory of price rests on the following assumptions (Bruegelmann, 1986):

- The only criterion for setting prices is the maximization of total profits.
- The firm produces only one product, if the firm is a multi-product company then all products are manufactured and sold in the same proportions.
- The decision-maker has exact knowledge about the company's total costs at each level of output;
- The decision maker also knows how much he can sell at each price. (Gabor, 1977)

Bruegelmann (1986) points out that " . . . a firm will increase its output until, at a certain price, its incremental revenue equals incremental cost, thus maximizing [its] profits. Based on this theory, economist advocate the use of marginal costing in pricing decisions. They argue those full-cost figures developed by accountants include irrelevant sunk costs, and that pure cost-plus pricing does not give enough attention to the intensity of demand and consumer behavior." (Hewitt, 1967)

3. Marketing

Marketing textbooks' recommendations for the pricing problem are more market-oriented than cost-oriented. Both variable and fixed costs are considered in setting prices but the pricing analysis begins with determining the value the product will provide to a potential user, considering demand intensity and customer psychology. (Bruegelmann, 1986)

4. Bruegelmann's Findings

Research completed by Bruegelmann (1986) suggests that, in practice, management uses some measure of full cost as a basis for pricing. Samuelson (1992) and Oxenfeldt (1961) have reached similar conclusions. However, most companies set a target or list price based on variable cost. A company would rarely strictly base the price charged for its services on a pure variable cost basis. (Bruegelmann, 1986)

The strict use of " . . . cost-plus pricing prevails despite the demonstratable fact that it will rarely yield maximum profit for the firm and is incompatible with the 'law of supply and demand.' It probably is employed, despite its inconsistency with economic doctrine, at least partly because of the power of the attitude that prices should be based upon cost alone." (Oxenfeldt, 1961)

In reality those who price a product should use a combination of the methods depending on the environment in which they are pricing. One must look at the expectations of that the price-setter has about the future. Many additional thoughts go into the development of a price. "The price-setter will invariably be concerned with such factors as the following: his own costs; the prices charged by competitors; the merits of the products that his firm sells relative to the offerings of rivals; the responses of firms that resell the product to any price decision he might reach; the possible reactions of suppliers, labor, and government to various prices he might charge; and, perhaps above all, the responses of prospective customers." (Oxenfeldt, 1961)

F. NAGLE'S VIEW

Nagle (1982) also disagrees with the use of a strict marginal cost approach. He states that "the fundamental economic principle that current profit is maximized when marginal revenue equals marginal cost is neither a practical nor 'optimal' prescription for action when demand is uncertain and when tomorrow's demand, cost, and competition are affected by today's pricing decision." He believes that " . . . economic models are not

useful guides to individual action, but rather tools to explain how markets allocate resources. The economic theory of price is a theory of the role of prices in a market, not a theory of how they are set, or should be set, in practice.”(Nagle, 1982)

Nagle (1987) has reached the same conclusion, as to the importance of the customers feelings, that Oxenfeldt (1961) has reached. He feels that “many managers correctly reason that by creating exceptional value through careful attention to their customers, they can reduce the importance of price in the buying decision. They also reason that price is of primary importance to their companies. They conclude, therefore, that it is quite appropriate to evaluate product, promotion, and distribution strategies from their customer’s perspective while evaluating pricing from the company’s perspective. He believes that companies often forget about the customer when pricing, focusing instead on the company’s need to cover costs, to maintain cash flow, or to achieve a target rate of return. That is a serious strategic mistake.”

Nagle (1987) also addresses the goals of the customer. The customer’s goal is to obtain the most value for his money. This may mean buying the least expensive offering. There are times however when a customer will be willing to pay more for a service that he feels may be superior. Usually the customer is basing his purchase decision on the value of the transaction to himself rather than the selling firm.

This apparent conflict between the goal of the firm and the goal of the customer can affect the firm’s profit line. “... The firm that sets prices from the perspective of its own internal needs generally foregoes the very profit it seeks. If a firm’s internal focus leads it to price below what buyers will pay, it will fail to realize its full profit potential. If a firm prices its service above what buyers will pay, the service will also fail to sell, and again the opportunity for profit is lost. Pricing based exclusively on the firm’s own financial needs is, therefore, inappropriate and ineffective.” (Nagle, 1987)

G. MARKET SEGMENTATION

Market segmentation, more specifically segmenting prices, can be an important part of a company's pricing strategy. Most services are bought by different market segments that frequently have different price sensitivities. The cost of servicing different buyer segments does not always vary for the same service. Segmented pricing (often referred to as price discrimination) involves setting different prices for different segments of the market. (Nagle, 1987) The ability of a company to segment pricing has allowed many companies to cover their high fixed costs. "For example without segmented pricing, many rail lines could never cover their cost, while others would be forced to either raise tariffs above the highest currently charged or suffer the same fate." (Nagle, 1987)

Samuelson (1992) suggests that "charging different prices to different market segments allows a firm more pricing flexibility. [There are] two conditions that must be held for a firm to practice price discrimination profitably. First, the firm must be able to identify market segments that differ with respect to their price elasticity of demand. The firm profits by charging a higher price to the more inelastic (less price-sensitive) market segment(s). Second, it must be possible to 'enforce' the different prices paid by the different segments. This means that market segments receiving higher prices must be unable to take advantage of lower prices."

Samuelson (1992) goes on to suggest ways that a firm can maximize its profit via price discrimination. "The markup rule provides a ready explanation of this practice. To illustrate, suppose a firm has identified two market segments, each with its own demand curve. The firm can then treat the different segments as separate markets for the good. The firm simply applies the markup rule twice to determine its optimal price and sales for each market segment. Presumably the marginal cost (MC) of producing for each market is the same. With the same MC inserted into the markup rule, the difference in the price charged to each segment is due solely to differences in elasticities of demand. The firm can charge the higher price to less price-sensitive buyers. At the same time, it attracts the

more price-sensitive customers by offering them a discounted price. Thus, by means of optimal price discrimination, the firm can maximize its profit.”

“Like the method just described, a second approach to price discrimination treats different segments as distinct markets and sets out to maximize profit separately in each. The difference is that the manager’s focus is on optimal sales quantities rather than prices. The optimal sales quantity for each market is determined by setting the extra revenue from selling an extra unit in that market equal to the marginal cost of production. In short, the firm sets $MR = MC$ in each market.” (Samuelson, 1992)

1. When to Segment Prices

Nagle (1987) suggests that there are specific instances when a firm should segment prices. It should be done when a firm has “customers who are relatively price insensitive, costly to serve, or poorly served by competitors.” In these instances these customers can be charged more than those who are relatively price sensitive, cheaper to serve, or well-serve by competitors.

2. Ways to Segment One’s Customer Base

Nagle (1987) breaks the ways to segmented a market or customer base into the following seven different categories: buyer identification, purchase location, time of purchase, purchase quantity, product design, product bundling, and tie-ins.

- *Buyer Identification*: If buyers in the different segments have obvious characteristics that distinguish them they can be segmented by buyer identification.
- *Purchase Location*: Customers in one market segment can be segmented by purchase location if they purchase services at different locations.
- *Time of purchase*: If customers in different market segments purchase at different times, a company can segment them for pricing by time of

purchase. An example is customers who use a service during periods of peak loading.

- *Purchase Quantity*: If customers in different segments buy different quantities, a company can segment them for pricing with quantity discounts. Quantity discount tactics include volume discounts, order discounts, block discounts, and two part prices.
- *Product Design*: This is one of the most effective ways of segmentation. It involves offering different levels or versions of service. To make this tactic work one must offer a lower-priced version that is in some way inadequate to meet the needs of price-insensitive buyers but still acceptable to buyers in the more price sensitive segment.
- *Product Bundling*: This method is a widely used tactic for segmented pricing. The products bundled together have a particular relationship to one another in their value to different buyer segments. Types of bundling include optional bundling, and value-added bundling.
- *Tie-ins and Metering*: Segmentation by tie-ins or metering is often extremely important for pricing assets. The reason is that buyers generally place greater value on an asset the more intensely they use it.

3. Examples of Price Discrimination

The following examples reinforce the idea that price discrimination is a common business practice (Samuelson, 1992):

- Airlines charge full fares to business travelers while offering discount fares to vacationers.
- Firms sell the same products under different brand names or labels at different prices.
- Providers of professional services (doctors, consultants, lawyers ect.) set different rates for different clients.
- Manufacturers introduce products at high prices before gradually dropping prices over time.

- Publishers of academic journals charge much higher subscription rates to libraries and institutions than to individual subscribers.
- Businesses offer student and senior citizen discounts for many goods and services.
- Publishers offer hardbound versus paper bound books.
- Colleges offer scholarships.

4. Forms of Price Discrimination

Samuelson (1992) states that price discrimination can be broken down into three different forms or degrees.

- *First-Degree*: Also known as perfect price discrimination, occurs when a firm sets a different price for each customer and by doing so extracts the maximum sales revenue. As an example, consider an auto dealer who uses the sticker price as a starting point in subsequent negotiations. The perfectly discriminating dealer will negotiate prices nearly equal to the values that each of his different customers are willing to pay.
- *Second-Degree*: This form occurs when the firm offers different schedules of prices. The most common example is the offer of quantity discounts: The seller charges a lower price per unit, which should entice the buyer to purchase a larger quantity. High-volume, price sensitive buyers will choose to purchase larger quantities at a lower unit price, whereas low-volume users will purchase less at a higher unit price. Perhaps the most common form of quantity discount is the practice of two-part pricing. Here the customer pays a fixed fee for membership or access and then an additional price for each unit purchased. Two-part pricing allows the firm to charge customers for access to valuable services while promoting volume purchases.
- *Third-Degree*: The practice of charging different prices to different market segments (for which the firm's costs are identical). Airline and movie

ticket pricing are examples. Prices differ across market segments, but customers within a market segment pay the same price.

5. Legal Aspects of Price Discrimination

When one hears the word discrimination, it generally conjures up fear and questions of the legality of the discriminating or discrimination practice. Nagle has addressed the legality issue as it pertains to pricing and it has been included here to clarify any misunderstanding. Nagle (1987) writes, "the Clayton Act proscribes some business practices. Section 2, as amended by the Robinson-Patman Act, deals with price discrimination and declares, in part, that"

It shall be unlawful for any person engaged in commerce . . . to discriminate in price between purchasers of commodities of like grade and quality

- where either or any of the purchasers involved in such discrimination are in commerce,
- where the effect of such discrimination may be substantially to lessen competition of tending to create a monopoly in any line of commerce, or to injure, destroy, or prevent competition with any person who either grants or knowingly receives the benefit of such discrimination, or with the customer of either of them.

Nagle (1987) discusses how the courts have interpreted these acts. Specifically, the courts have stated that these acts do not apply to discrimination in services. Commodities mean tangible goods. The courts have also ruled that "the term in commerce means that the act applies only if the injured party is a business whose ability to compete is hindered by the discriminatory price. Thus one can always charge some consumers a higher price than other consumers, since consumers are not using the product in commerce."

"Price discrimination violates the law if it harms competition at either of two levels. Primary level competition is between the firm that price discriminates and its own

competitors. Secondary level competition is between two firms that are customers of the firm that price discriminates." (Nagle, 1987)

H. RECOMMENDATION

Many variables should be considered when determining the appropriate price of a service. One should use the following approach when deciding whether or not to open the business in the first place. Generally an idea of a new product or service is the catalyst for individuals to band together and collect the necessary capital to form a business. I propose that those individuals need to clearly define the vision and the mission of their company to begin to focus on what they will be getting themselves into. The vision statement should not be designed to restrict the company but rather to give the company direction. The investors can then begin to decide some strategy related issues that will affect the way they price their service.

In this case the appropriate initial pricing strategy should be one of "maximizing long term profit." DecisionNet should not expect to recoup all of its investment and expenses during the first year or possibly first few years of operation. It should however, set up a schedule which addresses when it expects to be operating in the black and to provide a sufficient rate of return for its investors. This will enable the company to make investment decisions down the line and to track its progress.

DecisionNet is currently in the development stage. Before going on-line or going into business, a marketing survey needs to be developed and sent out to help determine the elasticity demand functions for the prospective consumers and their expected volume of usage. I believe that there will be four distinct groups (academic, corporate, government, and individual users) of users or customers. I also feel that each group can be successfully segmented and that each will have its own distinct demand curves. With this information DecisionNet can determine the appropriate price for its services.

While this information is being gathered, estimates need to be made as to the costs associated with providing the service to the customer, to include how the providers of the

on-line applications will be compensated. Since DecisionNet has been worked on only at the software coding and thesis levels there has been little investment in equipment and zero investment in facilities and personnel. Some costs will depend upon the volume of expected usage. Volume will determine the number and locations of the access facilities, and the number of employees needed to operate the facilities and the on-line help. Additional costs will be addressed in Chapter V of this thesis.

The estimated costs, demand curves, and volume of usage will then need to be studied. Only then can an informed decision be made as to the economic viability of DecisionNet. At this point, all costs incurred to date should be considered as fixed or sunk. Only the marginal costs, (those that will need to be incurred to set up and to operate DecisionNet) need to be considered with the revenue estimated to be received. Obviously, the revenues must exceed the costs over a predetermined amount of time. This excess or profit needs to be large enough to account for a return on investment worthy of the inherent risk in investing in a new and unproved business. Armed with this analysis, the owners of DecisionNet can decide whether to go on-line with the enterprise.

In the long run (a time frame in which all costs are variable and management expects to receive a normal rate of return on investment), a company must price its services using, at a minimum, the full cost approach. If all the costs incurred by a business are not recouped, plus a sufficient return on investment, the company would go out of business and the investors would take their remaining capital elsewhere.

The prices that DecisionNet will charge for its services will need to take into account the actual costs associated with providing those services to the users. It will also need to take into account how much the users will be willing to pay for such a service. Those amounts will depend on the individual demand curves of the user groups, the application that the user has selected, the assistance he requires, and the time he is on-line using the service, and possibly the time of day that he is on-line.

DecisionNet's proposed customer base has a limited number of competing alternatives from which to choose. These choices include buying the software outright, contracting out for the development of the software, or using in-house experts to develop

the software. The price charged for DecisionNet's services must be low enough to make those other methods of obtaining the software less attractive than DecisionNet. Since none of the methods are identical to DecisionNet, the prospective customer will base his buying decision on more than just the price of the service. It will involve the quality of service, the reliability of the service, the variety of applications available on the system, the delays involved with use of the service, the numbers of times that he expects to use a particular application, and the investment required in equipment and time to gain initial access to the system.

I. CONCLUSION

This chapter has given an overview of some factors that need to be considered when establishing a price for a service. It has shown that a company must first decide what the objective of its pricing strategy is. Next, it must look at both the anticipated full and variable costs associated with providing the service. While the costs are being estimated, a marketing survey should be sent out to establish the elasticity and demand curves associated with the users and the anticipated volume of usage. At this point an estimate can be made on whether or not the marketplace can be segmented. Once this information has been gathered, the company needs to decide if the idea is economically viable. Can the company make a satisfactory profit with the idea? If yes, then the company should make the necessary capital investment to start the venture. If no, then the company should look for another place to invest its money and energy. The following chapters make the assumption that the idea behind DecisionNet is economically feasible.

IV. REVIEW OF PRICING MECHANISMS

A. PRICING THE INTERNET

Many papers have been written which propose different methods for pricing the Internet so that its value to the users is maximized. (Bailey, 1995, Cocchi, 1993, MacKie-Mason, 1995) The Internet was developed and financed by the United States Government through grants given institutions like the Advance Research Projects Agency, and the National Science Foundation. Academics discovered it and have used it as a free and convenient way to get information out and to talk with colleagues. In 1996, the Internet has taken on a life of its own.

Beginning in 1992, the United States Government greatly reduced its grants to support the Internet. As a result, the National Science Foundation announced that it would cease to fund the ANS T3 Internet backbone. Since then, the United States Government has begun an effort to commercialize the backbone and many of its major nodes. This movement has been welcomed by private providers of telecommunication services and businesses seeking access to the Internet. The result is a largely unmonitored network of networks that is currently being paid for by both the private and the public sectors.

1. Internet Funding Picture and Future Outlook

MacKie-Mason (1993) describes how the Internet is being funded and suggests why there is a need for a change. "Most users are connected to a backbone through a 'pipe' for which a fixed access fee is charged, but the user's organization nearly always covers the access fee as overhead without any direct charge to the user [like the Naval Postgraduate School]. None of the backbones charge fees that depend at the margin on the volume of data transmitted or number of packets sent. (Cocchi, 1993) The result is that the Internet is characterized by the problem of the commons, and without instituting

new mechanisms for congestion control it is likely to soon suffer from server overgrazing.” This overgrazing results in congestion of the system and delay. Delay however is not a problem for all types of traffic. E-mail for example generally can handle some delay, real-time video and audio transmission, on the other hand cannot handle delay.

In the future there will be an increase in the requirement for prolong simultaneous high-end uses which will degrade service for thousands of ordinary users. In fact, the growth of high-end use strains the inherent adaptability of the network as a common channel. (Kahin, 1992) Some uses, such as real-time video and audio transmission, will lead to substantial increases in the demand for bandwidth. The problem of congestion will only get worse unless there is a substantial increase in bandwidth. Cocchi (1993) states “. . . that networks can more efficiently meet these varied service requirements if they offer multiple classes of service, so that a user can choose the class of service that is appropriate for her application . . . The purpose of multiple service classes is to degrade performance for those applications that are least sensitive in order to improve performance for those that are most sensitive. Lastly, in contrast to the current Internet, we believe it is likely that portions, if not all, of the future Internet will implement usage fees regardless of how the cost of the network is financed. However, by pricing the service classes appropriately, one can offer monetary incentives for reducing the quality of service requested. We expect pricing of the various service classes to be a vehicle commonly used to encourage users to make reasonable choices. Thus, we believe that pricing will be an integral part of the future Internet, and that the design of appropriate pricing policies will be a crucial enabling technology. (Cocchi, 1993)

2. Proposed Internet Pricing Mechanisms

Several pricing mechanisms have been proposed to price the Internet in the future. They can be broken down into two main types flat-rate pricing scheme and usage-base

pricing scheme. The concept of a usage-base system has also been incorporated in two additional systems called transaction and priority pricing.

The United States Government has not completely distanced itself from the pricing issue. It still has a definite view point on how it feels the Internet should be priced. The United States Government, in the Office of Management and Budget's (OMB) Circular A-130, "Management of Federal Information Resources," states that the costs for the information services should be accounted for in a way that provides an equitable sharing of the costs to provide these network services. The full costs of providing Internet services should also be directly distributed to the recipients of the services. (Bailey, 1995)

One common concern about pricing the Internet is that 'poor users will be deprived of access. This is not a problem with pricing itself, but with the wealth; we could ensure that certain users have sufficient resources to purchase a base level of services by redistributing initial resources through vouchers or lump sum grants. The total cost will be lower in an efficient network. (MacKie-Mason, 1995)

The following subsections will discuss the four previously mentioned pricing mechanisms.

a. Flat-rate pricing:

"A uniform per-byte price is charged and is therefore service-class insensitive." (Cocchi, 1993) Currently, most Internet users pay a fee to connect, they are not billed for each bit sent. (Bailey, 1995) One advantage of flat-rate pricing is that the costs of administrative overhead for billing can be avoided. There are however several disadvantages of this method. It does not provide an economic congestion control mechanism for bandwidth resource allocation. This is especially important with development of the next generation Internet Protocol. A flat fee for Internet service may not be equitable for the small time user. An example of a small time user might be a person that just uses the Internet for E-mail. In a flat-rate system that user will absorb more than his share of the cost of the Internet.

b. Usage-sensitive pricing:

“Users pay a portion of their Internet bill for a connection (this price could be zero, but rarely is) and a portion for each bit sent and/or received. The marginal monetary cost of sending or receiving another bit is non-zero during some period. It is possible, for example, to have usage-sensitive pricing during peak hours and flat-rate during off-peak hours, but we define the overall system as being usage-sensitive pricing. One of the constraints in developing a pricing system for Internet usage is that any cost recovery system should be equitable for the users.” (Bailey, 1995)

There are several benefits of usage-based pricing, they include: a more efficient use of the bandwidth and the capacity, and the system generates a revenue source for growth and expansion. (MacKie-Mason, 1995) Most of the current research on Internet economics analysis is in this area, and the economic community supports this approach.

There are also several problems associated with this method. One of the problems discussed is that it might discourage use of the Internet. This goes against the research and the educational goals for which the Internet was developed. (Bailey, 1995) Another problem involves the cost of accounting and billing. The cost would be astronomical if network providers were required to keep detailed accounts for every packet sent. However, the accounting load could be greatly reduced if one of the following approaches is adopted. Charges could be based on a statistical sample of packets sent, or packets could be priced only during congested periods. In the latter case most of the packets would not need to be accounted for. An additional approach is dependant on anticipated breakthroughs in the area of in-line, distributed accounting. This method would be dramatically different than the telephone systems centralized off-line model. (MacKie-Mason, 1993)

c. Transaction-based pricing:

The transaction-based pricing method is an outgrowth of usage-based pricing. In this method the prices are determined by the characteristics of the transaction and not by the number of bits or packets sent. (Bailey, 1995)

d. Priority pricing:

Priority pricing is also an off shoot of usage-based pricing. Where a higher per-byte price is charged for the high priority traffic and is therefore service-class sensitive.

3. Costs associated with Internet Usage

MacKie-Mason (1993) has broken the costs associated with Internet usage (that users need to consider when paying for resources) down into five different types of costs. "As a rule, users should face prices that reflect the resource costs that they generate so that they can make informed decisions about resource utilization."

- *The incremental costs of sending extra packets.* If the network is not congested, this is essentially zero. The price of sending a packet in an uncongested network should be close to zero; a higher price is socially inefficient since it does not reflect the true incremental costs. If the incremental cost is high enough to justify the cost of monitoring and billing, it should be charged as a per-packet cost.
- *The social costs of delaying other users' packets when the network is congested.* This is not directly a resource cost, but should be considered part of the social cost of a packet. Users bear this cost through delay and dropped packets, and would often be willing to pay to reduce congestion. The price for sending a packet when the network is congested should be positive: if my packet causes the delay of another user's packet, then I should pay the cost I impose on the other user. If my packet is more valuable than hers [can be determined using a method similar to that proposed with Smart

Pricing (MacKie-Mason, 1993)], then it should be sent; if hers is more valuable than mine, then hers should be sent.

- *The fixed costs of providing the network infrastructure.* These costs include the rent for the line, the cost of the routers, and the salary for the support staff. The initial investment in network infrastructure is a discrete decision: a certain amount of money can buy a usable network on minimal size. What criterion can be used to decide whether the initial investment is warranted? The natural principle to apply is that total benefits should exceed cost. The existence of an uncongested network is a public good that provides benefits for all users without exclusion; that is, Peter's use does not preclude Paul's use. Therefore we should add up how much all potential users would be willing to pay for the network infrastructure, and see if this total willingness-to-pay exceeds the cost of provision. In a computer network like the Internet, it is natural to think of paying for the network infrastructure with a flat access fee. Each party who connects to the network pays a flat price for network access distinct from the usage-based fee described earlier.
- *The incremental costs of connecting to the network.* Each new connection to the Internet involves costs for access lines and switching equipment. Each new user requires a connection to the network. Occasionally, this connection may share an existing facility, for instance using a home phone to make a dial-up connection. Such a connection imposes no new costs and should be priced at zero. Other connection may require new cables, a router, and other investments. Each user should be charged the cost of installing a connection to the backbone as a single, one-time connection fee.
- *The cost to expand network capacity.* This normally consists of adding new routers, new lines, and new staff. If network usage never reaches capacity, even at no cost for packets, then clearly there is no need to expand capacity. Usage prices that are based on congestion provide guidance about when to expand capacity. Consider the model with fixed capacity: Packet prices measure the marginal value of the last admitted packet. If the cost of expanding capacity to accommodate another packet is less than the marginal value of that packet, then it makes economic sense to expand capacity. If expansion costs more, it is not economically worthwhile . . . Furthermore, if network congestion is properly priced, the revenues collected from the congestion surcharges can be used to fund further capacity expansion. Under certain

conditions, the fees collected from the congestion charges turn out to be just the 'right' amount to spend on expanding capacity.

4. Lessons from Usage-Sensitive Cost Recovery Networks

Several efforts have been made to implement a usage-sensitive cost recovery system. (Bailey, 1995) The Department of Defense (DoD) implemented this type of method with the Defense Data Network (DDN), in order to comply with the OMB Circular A-130. The intent of this system was to have each branch of the military pay for its usage of the network to recover the cost. This approach has backfired partially due to the way that the different service budgets are formulated. It was difficult to budget money for the DDN since usage varied greatly from month-to-month. This usage-sensitive system has not generated the result for which it was designed. Instead of the branches using the DDN, they have developed their own Internet protocol (IP) networks. Those networks have been paid for using the more traditional flat-fee model. (Bailey, 1995)

Bailey (1995) also feels that consumers prefer a flat-fee vice a usage-based pricing model. One example that he sites which supports this opinion deals with an Internet service provider (ISP) based in Italy. The . . . "ISP had a usage based pricing policy which was replaced by a flat-fee model to meet consumer demands. They charged per E-mail message sent, per megabyte of data received, and hourly fees for other services under their usage based model. Another service provider entered this market offering the same services, but with a flat-rate annual fee. The migration to the later ISP was so overwhelming that the usage based pricing policy of the former was replaced by a flat-fee model."

One should remember why these two attempts at using a usage-sensitive cost recover model have failed. Four conclusions can be drawn from those two cases.

- It is difficult to budget money for a network expense that is uncertain.
- Users will build their own networks to avoid usage of the usage-based charging networks.

- There will be large administrative costs which may offset any perceived benefits.
- Users would prefer to pay a potentially higher fee to avoid the uncertainty of a usage sensitive pricing system.

These may not be the only reasons why a usage-based cost recovery scheme has not worked out, but they outline the major ones that affected the DDN and the Italian networks. (Bailey, 1995)

The only successfully usage-sensitive recovery model that this research discovered was implemented in New Zealand. The international link to the United States is paid for on a usage-sensitive basis. Bailey (1995) states that the major reason for its success . . . “is that it was a policy implemented before the network was [developed] and it was, arguably, the only way to pay for such an expensive link.” (Bailey, 1995)

B. CHARGE BACK, A METHOD TO RECOVER COSTS FOR COMPUTER SERVICES

Charge back is a method used mainly for recovering the costs incurred for providing computer services to other departments or commands within one company or government entity. Emery (1987) writes that a “strong argument exists for charging users for the computing services that they receive. A user receiving ‘free’ services tends to over consume them. This often results in costs to the organization exceeding the benefits. Data center management, too, has no great incentive to strive for efficiency if users do not pay for information services and consequently do not exert pressure for lower costs.”

There are several difficulties associated with the charge back method. The main one involves the allocation of fixed costs. This difficulty is amplified when the system does not serve a single user, or a group of users within one organization. Information systems tend to have a high fixed cost component and a low variable cost component. (Emery, 1987)

How can the costs be accurately distributed to the users? This task is simple "... if only one job at a time runs on a computer, each job can be allocated all costs for the duration of the time it is on the machine. In a shared system [much like DecisionNet] with many simultaneous users, however, different jobs compete for different resources at the same time. The jobs tend to require a different mix of resources-- an engineering calculation may require considerable CPU time, for example, while a typical processing task spends much of its time on input -- output operations."

The conventional means of charging for a job run on a large mainframe computer consists of the following steps:

- All the various costs of running the computer center are estimated for the time period in question--the forthcoming budget year, say, if prices are set in advance on an annual basis.
- A set of resources is selected to serve as the basis for charging for work; these typically include CPU time, input-output volume (e.g., the amount of data transferred between main memory and disk or tape storage), the volume of data stored on disk, and the number of lines printed.
- Estimated costs over the time period are allocated to each of the resources, and generally include allocations of such indirect costs as data center management, computer operators, space, and power.
- The allocated cost of each resource is divided by its estimated usage to determine its charging rate; for example, if the total cost attributed to the CPU is \$100,000 over the next year, and four million seconds of productive CPU usage are estimated for this period, the charging rate for the CPU is \$100,000/four million, or 2.5 cents per second.
- The usage of each resource is measured when a job is run; this usage, multiplied by the appropriate charging rate and summed over all resources, then determines the cost of the job (e.g., the CPU component of a job requiring 100 CPU seconds at 2.5 cents each would be \$2.50).
- Users are presented with periodic bills for all jobs run during the billing period: these bills typically include a breakdown of costs itemized by resources consumed.
- The variance is disposed of by (1) absorbing it as an overhead cost for the period, (2) rolling it forward as an adjustment for the charging rates during the next period, or (3) retroactively changing rates and adjusting user bills so that the center ends up with a zero variance. (Emery, 1987)

As mentioned earlier there are several deficiencies with this method. Emery (1987) has compiled the following list which addresses a few of them.

- The system is complex, expensive to administer, and difficult for users to comprehend.
- Users generally have considerable difficulty relating their use of the computer to the itemized charges they receive.
- The costs levied against a given user depend not only on his own use of the system, but also on other factors over which he has no control (e.g., the efficiency of the data center and the total load on the system); consequently, the user may find it difficult to make rational tradeoffs between the cost and value of the services received.
- Rates are set at a level inversely related to expected demand, leading to undesirable user behavior -- for example, if demand goes down, the rates for the remaining users go up, thus further depressing demand.
- Retroactive adjustment of rates to distribute the residual variance has several perverse effects; (1) it patently serves no useful managerial purpose in allocation resources, because users have no control over their past usage; (2) it makes planning and budgeting very difficult for users, since they do not know the charges until after their consumption of services; and (3) it does not encourage efficiency on the part of the data center, because the data center passes on to users all the effects of its own inefficiencies.

Charge back policies must be tailored to the needs of each organization, but the following general guidelines raise many important issues:

- Standard rates, rather than "actual" (retrospective) costs, should be used as the basis for charging users; these rates should be based on expected volumes and an acceptable level of efficiency over the forthcoming accounting period (a year, say).
- Unbundle charges--providing a separate "a la carte" price for each individual resource--so that users pay for the services they actually consume rather than on the basis of an average mix of resources.
- Use price differentials to motivate desirable user behavior (such as discounting nighttime prices to shift work to a time when idle capacity is available).
- Charge fixed prices for services that have a relatively small (or predictable) demand for resources, such as a fixed monthly price for dedicated workstation and electronic mail services.

- Use a fixed-price contract for each stage of a software development project, possibly with a fixed upper limit on the project as a whole.

Emery (1987) further states that "... the vast majority of users consume a fairly predictable and low level of services, and so charging on the basis of minor differences among them would affect total costs; in these cases, then, charges can be based on average per capita usage of the standard set of services. This leaves only the relative few users with large discretionary demands for shared resources as the prime target of the more complex pricing schemes."

C. COMPARABLE INDUSTRIES

This section addresses how several industries have decided to price their services. Some pricing theory is addressed, but this section has mainly been included to show how their pricing schemes are set up.

1. Internet Providers

MacKie-Mason (1993) breaks down charges levied by Internet providers into three major components: an annual access fee, an initial connection fee and in some cases a separate charge for the equipment on the customer's premises (a router to serve as a gateway between the customer network and the Internet provider's network).

All of the providers use the same type of pricing: an annual fee for unlimited access, based on the bandwidth of the connection. These pricing schemes provide little incentive to flatten peak demands, nor any mechanism for allocation of network bandwidth during periods of congestion. MacKie-Mason (1993) feels that "it would be relatively simple for a provider to monitor a customer's usage and bill by the packet or byte. Monitoring requires that outgoing packets be counted at a single point: the customer's gateway router. However, pricing every packet would not necessarily increase efficiency, because the marginal cost of a packet is nearly zero. Since it is bandwidth that is scarce,

efficient prices must reflect the current availability of bandwidth. Neither a flat price per packet nor time-of-day prices would closely approximate efficient pricing.”

2. On-line Information Service Provider

The distinction between an on-line information service provider and an Internet provider has all but disappeared. For this thesis the distinction is in terms of bandwidth required. Internet providers service the large scale user who requires T1 access and is transmitting a large number of packets on a daily basis. An on-line information service provider can also provide Internet access, but is designed for the home user. Usually it also provides a number of additional services such as research assistance, stock portfolio tracking, news groups and electronic newspapers. It also receives its revenue from a variety of sources. An on-line service provider will charge fees to the companies that advertise and sell their goods and services via its on-line service. It will also charge users a monthly subscription and incremental usage fee. The next paragraphs will address specific on-line service provider companies and how they price their services.

Prodigy allows only 30 companies to sell products on-line. Those companies are charged a hefty one time fee which ranges between \$24,000 to \$30,000. Prodigy also takes a 10% cut of each companies computer-based sales. (PC Week, 1994) The fees charged to the home user do not differ much between the companies. Microsoft charges a monthly fee and it offers a la carte services at incremental prices. American On Line also charges the user a monthly fee for five hours of on-line time and then charges that user an incremental fee for each additional hour.

Internet-In-A-Box attempts to segment its customer base by offering different levels of service. It offers two types of service to its customers. The services are called Silver Surf Club and Gold Surf Club. The difference between the two types of memberships lies in the numbers of hours that the user is given to use each month. The charge for the Silver Club includes a flat monthly fee of \$9.95 for the first seven hours of usage and an additional charge of \$1.95 for each additional hour. The Gold Club charges

\$0.99 per hour up to the twentieth hour of usage and then an additional fee of \$1.95 per hour. (Lane, 1995)

3. On-line Research Companies

Several companies and United States Government agencies have begun making information available to users either on-line or in the CD ROM format. This information is generally available to all users who have the necessary access equipment and are willing to pay the usage fees. These entities have incurred large sunk costs in setting up the service as well as the processing of the information. They also incur incremental costs in providing the service (servicing each individual request) to the user. This incremental cost is often small, and in some cases can be close to zero. This subsection will look at several information providers and how they charge for the services that they offer.

Adonis has made access to a collection of more than 600 print journals available on CD-ROM. The company charges a subscription fee of \$20,000 per workstation. They also charge the user an additional \$34,000 for the ability to print articles and an additional (incremental) fee of \$7 for each article that is printed. Nexis/Lexis, an on-line information provider, charges an hourly usage fee of \$400 and a printing fee for each article printed. (Crankshaw, 1995)

The United States Government also makes a substantial amount of information available on-line. FedWorld, operated by the Department of Commerce, offers an electronic bulletin board and gateway service to Federal government information. FedWorld provides both dial-up and Internet access. Several thousand files are available for viewing or downloading at no charge, however, many selected documents are only available for a download fee. The Government Printing Office (GPO) provides federal information in a variety of electronic formats. That information includes the Budget of the United States Government, the Code of Federal Regulations, the Federal Register and the Congressional Record. Users may download the full text of documents only if they establish accounts with the GPO. Charges are based on the size of a file downloaded or

displayed on a user's screen. The minimum charge is \$2 and the charge for an average size file is \$7. A one megabyte file costs approximately \$21 to download. (GSA Report, 1994)

4. Telephone Service Providers

The telephone system has developed differently from the Internet. It has developed from a single network which was designed to provide one type of service (voice). The Internet, on the other hand, is a network of networks and is home to many applications and media. Instead of users getting charged after they use the service on a usage-sensitive basis, they are generally charged a flat fee for some kind of connecting charge. (Bailey, 1995) Local telephone companies successfully segment their marketplace by distinguishing between residential and business users. The residential user is not metered and is charged a flat fee for service. The business user is metered and is charged a usage-based fee. (Haga, 1996)

Since the system was designed to accommodate speech, specific data rates and delays were chosen. The performance of a phone call is independent of the speed of the underlying phone lines. In case of an overload, excess calls are blocked, rather than allowing all calls to connect, delivering degraded service to them all. Shenker (1993) describes the telephone network as a circuit switched network. "Phone calls require an explicit preallocation of resources while the connection is being established. Calls are blocked if sufficient resources are not available." (Shenker, 1993)

One of the major costs of a phone call is the overhead associated with the billing of that call. The exact percent of the billing overhead is unknown, but is said to account for approximately 50% to 80% of the phone bill. (MacKie-Mason, 1995, 1990 RAND report R-3909-ICTF). The RAND report breaks down a phone calls cost in the following way:

- Summary billing: 0.1-0.2 cents per call
- Itemized: 0.7-1.2 cents per call
- Account maintenance: 50-75 cents per month

- Incremental cost of call:
 - Non-busy -0
 - Busy period = 6-11 cents per call
 - Averaged =1.2-2.4 cents per call
- Annual total cost per T1 connection is about \$25,000 to \$35,000

The normal residential phone customer pays several different fees to the phone company. The first is a one time access fee. He is also charged a monthly service fee for local usage and an incremental fee for long distance charges. The one time access fee is designed to cover the costs of establishing the service and setting up the customer's account. The phone company can get by with charging a flat monthly fee for local service, because its costs at this point are all fixed and for that matter considered sunk. The incremental charge for long distance is also appropriate, since there is a variable cost to provide this service and it provides an equitable way of recovering those costs.

5. Airline

The airline industry has years of experience in market segmentation. There may be as many as ten different ticket prices paid by passengers on any commercial airplane in the sky. This can be accomplished because the industry understands that it has several different types of passengers, and that each type of passenger has a different price sensitivity. The airline varies its pricing to get the maximum amount of money for each passenger type, but it realizes that it is selling a perishable product, that of an airline seat. Once that aircraft leaves the gate all unoccupied seats are worth zero. The factors that the airline industry needs to consider include: the cost of the flight (including fuel, labor, and administrative costs, the historical pattern of business and leisure use on the route, overall economic conditions (which affect travel demand), and the prices charged by competing airlines. The game is called "yield management." (Samuelson, 1992)

D. ECONOMICS OF ELECTRONIC PUBLISHING

The arrival of the Internet and electronic publications has forced a paradigm shift for those in the publishing industry. Academic press's are currently reevaluating how they should charge customers to recoup the high costs of first copy production and to cover the incremental costs of all following units sold. (Day, 1993)

1. Cost Structure of Written Works

There is a distinctive cost structure for books, journals, and electronic documents. Day (1993) states that most publishing costs are incurred in getting to the point where one can make the first copy, or send the first copy over the net. The incremental costs of making additional copies are small (in electronic publishing - probably very close to zero). "Economic theory argues that the output of a good should be expanded until the cost of the last copy made is equal to the benefit to the last buyer who buys the last item sold. If we stop before that point, there are buyers who would gain utility greater than the social cost of making that item who do not in fact obtain it." (Day, 1993, Nagle, 1987)

Society's net benefit is maximized if the price of obtaining the document equals the incremental cost of producing the document. So there is a clear and substantial conflict between the publisher's need to cover costs and the optimum of having price equal to incremental cost. There is nothing new about this situation. Publishers have always had to price well above incremental cost. So buyers who would gain benefit from possession of the book that is greater than society's cost of providing the book have been deterred from purchasing. Various mechanisms for recovering some of the first copy costs without loading them onto the individual purchaser have developed. Subsidies and help in kind to university presses, title specific subsidies, have been designed to support exceptionally high first copy costs. Also higher prices to libraries than to individuals, either through differential subscriptions or through different editions-- paper for the individual, cloth for the library, operate to bring the individual purchase price closer to incremental cost. (Day, 1993)

2. Cost Recovery Solutions

As mentioned earlier, there is often a conflict between optimal pricing and cost recovery. The remaining parts of this section will describe several potential solutions. These solutions address the problems inherent in pricing electronic publications, specifically those from academic presses. This section addresses five types of solutions: socialization, special tariffs, price discrimination, elimination of all price mechanisms, and mutualization.

- *Socialization*: This would involve nationalizing academic writings, or setting up an organization which would be jointly owned by all universities and would handle academic writing.
- *Special Tariffs*: The next type of solution to the cost recovery problem uses special pricing structures. "Much of the literature in this area is driven by the problems involved in pricing for electric utilities. Presses need to recover high initial costs while setting a price close to incremental cost so that no one whose benefit from the product is greater than the incremental cost will be deterred from buying. One common structure for this kind of problem is what has recently been described as 'country club' pricing or 'two-part tariff'. You pay a membership fee and also pay the incremental costs for all the things you do within the country club. There are many other similar applications of this kind of system." (Day, 1993)
- *Price Discrimination*: Day (1993) feels that some customers will value goods more highly than others. "If the high valuation customers could be segmented from the low valuation customers, a higher price could be charged to the former than to the latter. The lower price would be close to incremental cost while the higher price would permit first copy costs to be recovered."

An example of this in publishing is the delayed paperback. First, the high-priced hardcover is published for

those with a strong and urgent need for the book. Then when the high valuation customers have bought and the first copy costs have been recovered, the paperback is brought out with a price that is close to the incremental production cost.

Another way to segment customers is to bundle the good with another good or service. If the added item is generally wanted by the high valuation customers, but not by the low valuation customers, then the combined package can be priced to recover not only the cost of the bundled item but also some of the first copy costs of the basic item. Bundling is definitely a route to explore in endeavoring to solve the problem of recovering first copy costs. (Day, 1993)

- *Elimination of All Price Mechanisms:* Another suggestion to the pricing issue for academic publishing is to eliminate the price mechanism altogether. The proposal would have all academic publishing fully subsidized presumably through taxes. (Day, 1993)
- *Mutualization:* This is what currently exists. "One entity is worried about cost recovery, while another entity is worried about the impact of increasing prices on its budget. In most cases of this general kind, the two entities are distinct and distant, we therefore need a solution that works through a market-type mechanism to a solution that ensures, at least viability for each entity and moves us to a position that minimizes social costs and maximizes social benefits. The prevailing mind set is a customer-supplier one. In other words we have mutual ownership but seek none of the benefits that mutual ownership should give us. So in pursuing mutualization, we need the press to have wider horizons than just its local institutions. Our challenge is to design a system that gains the benefits of mutuality without forcing the presses back to an exclusively local focus." (Day, 1993)

When using these approaches one must assume that costs are well defined and easily agreed upon. They require that an auditor could examine a publishing operation and easily determine exactly what each publication costs. Unfortunately, many expenses of those organizations are not directly related to any one product. Day (1994) goes on to point out that these approaches all have one important point in common. They are all simple. People who develop pricing schemes must resist the temptation to make them complex. They need to ensure the prices are easily workable for both the seller and the buyer. The customer must be able to understand the logic and see that the schemes have integrity.

E. IMPLICATIONS/APPLICATIONS TO DECISIONNET'S PRICING

Several pricing or cost recovery methods used in the previous sections can be used to help develop DecisionNet's pricing mechanisms. The following subsections will pull out some of the positive and negative points and show how they can apply to DecisionNet.

1. Internet Pricing

Most of the costs incurred in providing communication services are fixed. That will also be the case with costs incurred by DecisionNet. The incremental cost of a transaction to DecisionNet will also be small and in some cases close to zero. The Internet is currently faced with the problem of congestion. Congestion may prove to be an issue in the future for DecisionNet if not properly planned for. Initially, however, the system will be designed to handle the anticipated volume. Congestion, in the long run, will hopefully be prevented as a result of continuous system monitoring and the planning for expansion in the system, and growth in the number of users.

The pricing mechanisms that are being considered for implementation on the Internet may also prove to be viable for use by DecisionNet. A straight flat-rate pricing

method seems easy enough to understand and simple enough to implement, but it may not be equitable to all of the users of DecisionNet's services. A variant of the usage-sensitive pricing method known as priority pricing, has several advantages which may prove transferable to DecisionNet. This method in effect attempts to measure the utility received by the different users of the service. With this information one can break up the marketplace and charge different amounts to the different users based on the utility. This method may not prove to be very efficient if it has to be completed each time a user uses the system. It may also discourage users from using the system if the fees vary from session to session. Care will need to be taken to avoid designing a system that is both efficient and equitable, but scares the users away due to the uncertainty in the fee to be charged for the service.

2. Charge back

The services that will be offered by DecisionNet are very similar to those for which the charge back method of cost recovery was designed. Several lessons can be learned and considered when designing DecisionNet's pricing policy. Emery (1987) makes a strong point for charging the user only for his share of the services received. This is often difficult when one is attempting to recover the high fixed costs associated with providing computer services. Allocating equitably those costs to the users of the system is often difficult. The most equitable way to recover those costs may be through some form of a membership fee or a one time buy in fee.

Several different methods have been implemented, in different charge back schemes, designed to measure usage of computer services. Some of the most commonly used ones include CPU time, input/output volume, and number of lines of print. These methods are often difficult for the user to comprehend and may not be a good measure for billing DecisionNet's services. A better measure may be the number of sessions and/or the number of services used. Most charge back methods are complex and so may not be a good model for DecisionNet. However, the lessons learned from the deficiencies of the

general charge back system will prove valuable in designing DecisionNet's system. Specifically, DecisionNet's pricing mechanism should be designed so that the user can easily relate his usage to his itemize charges. An la carte fee system should be available so that users can choose the services that they need. The user should also not be forced to pay for a group of services when he only needs one or two. An additional approach that could be implemented by DecisionNet (to make its pricing scheme as simple as possible) would be to charge a fix amount for services that have a small or predictable demand for resources.

3. Comparable Industries

The section on comparable industries also offers many ideas that can be incorporated into DecisionNet's pricing policies. The on-line providers breaks down the fees charged to cover different types of services and to recover the different categories of costs (fixed and variable). Their use of an annual fee may be directly transferable to DecisionNet as a means of recovering some of the high fixed cost associated with its system. An annual fee alone will not cover the variable costs that DecisionNet incurs with each transaction and it would not be equitable to all users.

The pricing systems used by both the on-line information service providers and on-line research companies closely resemble that of DecisionNet. They attempt to segment the marketplace by offering different levels of service at different prices to their users. They also attempt to cover their high fixed costs with some form of a fixed fee while then attempting to cover the incremental costs by having a variable fee for those users that go beyond the base service level.

The telephone industry also offers several lessons in which DecisionNet can learn. The biggest lesson involves how the telephone companies currently account for a phone call. The overhead associated with accounting for each individual phone call is extremely high. One should attempt to design a tracking system for billing of the individual sessions that does not cost more than the service itself.

Telephone companies have developed a fee structure which attempts to recover the high fixed costs and the variable costs associated with providing its services. One of the fees charged by the telephone companies is the setup fee. DecisionNet may consider charging a one time user setup fee like the telephone industry. However, this type of fee may prove to be counterproductive since it may discourage users from trying the service.

The idea of a flat monthly fee similar to that charged for residential service would not be equitable to all users. An optional monthly or annual membership fee could help recover some of the fixed costs. Users will need to be enticed to become members. This could be accomplished by adding a percent discount off a variable usage charge for sessions to those who choose to join. An incremental usage fee is equitable and could be implemented to recover the variable portion of the user's session cost.

The airline industry also offers some tips that can be implemented in DecisionNet's pricing scheme. This industry is often mentioned as a model in discussions of market segmentation. DecisionNet may be able to employ this tactic in its pricing strategy. If DecisionNet can segment its marketplace then it will be able to price its services so that it will maximize the price charged to each different user group. This charge would be based on their individual group's price sensitivity.

4. Electronic Publishing

The electronic publishing industry also faces some of the same costs that DecisionNet is anticipated to incur (see Chapter V). The "county club" or "two-part" pricing technique could be applied to the pricing mechanism developed for DecisionNet. A user would pay a one time or annual membership fee and then pay an incremental fee for all the services that he uses within the "county club" or in this case DecisionNet's system. Some variant of price discrimination may also apply. If the customers that are price insensitive could be segmented from those that are more price sensitive, than a higher price could be charged to the former than to the latter. The lower price charge would be

close to the incremental cost while the higher price would permit some of the high fixed costs to be recovered.

F. CONCLUSION

This chapter describes pricing strategies that are currently being used in industry. Internet service pricing is still in its infancy. It is believed that a robust pricing strategy can be developed for DecisionNet by becoming familiar with the theory of pricing and evaluating how industry is currently applying it. The points discussed in this chapter will become the basis of DecisionNet's pricing policy which will be explained in the next chapter.

V. SUGGESTED PRICING SCHEMES

A. COSTS

The following list includes those costs anticipated to be incurred during the setup, operation, maintenance, and upgrading of companies like DecisionNet. I anticipate that several costs will be overlooked. This section is designed to give the reader a guide and a starting point for planning purposes. Many costs may be applicable to several categories. This is a result of the categories overlapping the several time periods.

The costs incurred by the company refer only to expenses. This will not directly include the costs of purchasing assets. An asset is something owned by an entity and has value. This would include land, buildings, and equipment. An expense, on the other hand is an item of business outlay that can be charged against revenue for a specific period. (Webster's New Collegiate Dictionary, 1981) This would include utilities, advertizing, and salaries that have not been prepaid. The cost of the assets acquired by DecisionNet will be depreciated over the appropriate accounting period according to the *Generally Accepted Accounting Principles* (GAAP). This depreciated amount will be considered an expense during the correct accounting period.

- Setup: This category includes all expenses incurred before the opening of the business.
- Operations: This category begins once the company starts offering its services to the public. The expenses will include:
 - Office Space Rental
 - Insurance
 - Depreciation (Plant and Equipment)
 - Office Equipment Rental
 - Utilities
 - Advertising
 - Personnel
 - Training
 - Recruiting
 - Accounting

- Taxes
- Interest
- Health Care
- Decision Technology Providers
- Cleaning
- Maintenance (Service and Preventive)
- Upgrade: The costs associated with this category will be incurred throughout the existence of the company. The costs will involve all outlays associated with planning for expansion of the services provided, and the costs of implementing that expansion.

Most of the previously mentioned costs can be easily placed in one of the following two categories (1) fixed costs and (2) variable costs. Remember that fixed costs are those that remain constant in amounts despite changes in production or sales volume. They arise from providing capacity and from keeping this capacity in readiness regardless of the extent to which it is used. Variable costs are those which vary directly and proportionately with production or sales volume. One can also distinguish whether a cost is directly or indirectly related to providing a specific service or a specific user's transaction. These distinctions will be necessary in determining an appropriate pricing scheme for DecisionNet's services.

Not all expenses easily fit in one category. In the cases where they do not we rely on cost accounting experts for guidance. An example of such a cost is the cost of compensating the providers (research data, models, solvers, and decision support packages) of the on-line software and accounting for customer billing. The allocation of these cost's will depend on what each individual line expense is for. Section C has been included specifically to address the compensation of providers. A good rule of a thumb to help management in determining whether or not an outlay is fixed or variable is to assess if the manager has immediate control over the cost. If he does, it is variable if not it is fixed.

The next two subsections will place the outlays addressed in either the fixed or variable category.

1. Fixed Costs

- Setup: The costs incurred during the setup phase are considered fixed and therefore sunk. Once these costs have occurred, they should not be specifically considered in determining the session usage cost for DecisionNet. However, these costs should be recouped during the long run operation of the company. There will be a specific attempt to recover these through membership fees.
- Operations:
 - Office Space Rental
 - Insurance
 - Depreciation (Plant and Equipment)
 - Office Equipment Rental
 - Utilities
 - Advertizing
 - Personnel (Payroll)
 - Training
 - Recruiting
 - Accounting
 - Taxes
 - Interest
 - Health Care
 - Decision Technology Providers
 - Cleaning (Contract)
 - Maintenance (Contract Service and Preventive)
- Upgrade: The costs associated with the upgrading of the office space and equipment will be considered fixed or sunk after they are incurred.

2. Variable Costs

In the long run, all costs are considered variable. For this thesis we will only be considering the short run, where the previously mentioned costs are considered fixed. The following list will show the outlays considered variable in the short term. Only the operations category has costs which fall in the variable cost area.

- Operations:
 - Utilities
 - Personnel (payroll)
 - Taxes
 - Accounting (Customer Billing)
 - Decision Technology Providers

Most costs incurred by DecisionNet are fixed and should be considered sunk when determining DecisionNet's pricing schemes. Fixed costs are relevant in determining the long term economic viability of the firm. These costs will need to be eventually recovered. They will, however, not be directly considered when determining the cost of the specific user's session (on-line usage fees). Only the variable costs that can be directly attributed with a specific transaction or session are relevant.

There are several variable costs that should be considered in the incremental pricing scheme. They include utilities (telephone connection charges, and electricity) personnel costs (payroll for on-line assistance operators), taxes on sales transaction, account setup costs, account billing, and transaction fees for decision technology providers. Some of these variable outlays may be incidental and not worth the expense of tracking. The fees paid to the decision technology providers will be discussed in the next section.

B. PROVIDERS EXPENSES

The pricing policies of DecisionNet services will be affected by the method(s) used to reimburse providers for the use of their applications. That costs could account for the largest portion of the incremental usage fees that DecisionNet will charge for each user's session. As mentioned earlier, this thesis is concentrating on the aspect of the business in which DecisionNet is facilitating the availability of software on the Internet. As such, this section is mainly addressing how to reimburse the providers for the software that they have developed. In reality several other scenarios will exist, some of which will have the

providers paying DecisionNet to place their software on its system. Recall that DecisionNet anticipates being used to not only to execute work related operations, but also for providers to advertize their products and for consumers to evaluate software.

DecisionNet will enter into a variety of contracts with the providers. This section will discuss three possible types:

- The providers are paid a one time fee for DecisionNet's use of their software on its system.
- The providers are paid an incremental fee for each access to their software. This fee may vary given the number of accesses.
- The providers are paid a flat fee plus an incremental fee.

The providers of software to DecisionNet can receive a substantial benefit from having their software available on DecisionNet's system. The on-line service can help facilitate the connection between the users and providers by making it easily accessible and providing on-line assistance (help services). It will also make the software available to a larger base of users by making the software's use less expensive. This greater volume is due to (1) the on-line help offered by DecisionNet and (2) the reduced price that will be charged for what is in fact the "rental of the software."

The following subsections will discuss the types of fee structures that can be used to pay the providers. Several figures have been included. The numbers used in those figures are fictitious and only there for illustration purposes. There have also been two constraints placed on the figures and following formulas. The first addresses time. The time periods (T) associated with the fee structures will be determined in the contracts entered into with the providers. The second addresses, the numbers of accesses or range of accesses. This number will always be an integer.

1. Flat Fee

DecisionNet would pay a one time fee for the unlimited use of the software. That fee would be considered fixed and sunk (Fig. 1). This outlay will not vary with volume sales and cannot be directly attributed to anyone user or user's transaction. Therefore, it should not be considered in the marginal cost estimation of DecisionNet's services. The incentive for the provider, here, would be the guarantee of a fixed amount for the software. In a flat fee type contract most of the risk lies with DecisionNet. The flat-fee structure can also be represented as a generic formula.

$$C = F$$

Formula 1. Flat Fee Structure.

C = Total Cost Incurred by DecisionNet for the Providers Software over time (T).
F = Flat Fee.

The constraints, the variables, and the formulas to be used in these subsections have been collected in Tables 1, 2, and 3 respectively.

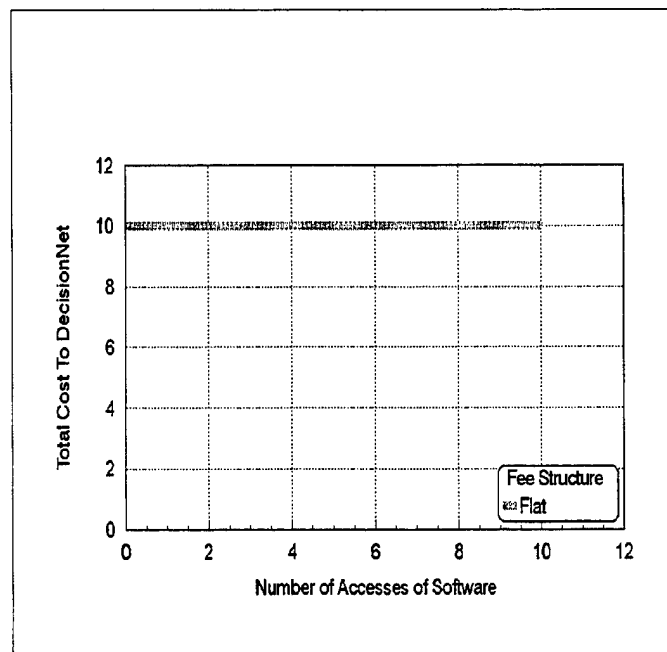


Figure 1. Flat Fee Structure

Constraints	
	Period of time to be determined in the contract between the provider and DecisionNet
	Numbers of accesses will be an integer

Table 1. Constraints

Variables	
T	Period of time covered by the fee
X	Number of accesses
X_1, X_2, X_3, \dots	Set range of accesses
C	Total cost to DecisionNet for the providers software over T
F	Flat fee
I	Incremental fee per access
I_1, I_2, I_3, \dots	Incremental Fee's possible for a given range

Table 2. Variables for Providers Formulas

Formulas		
Flat Fee	$C = F$	Formula 1.
Incremental Fee	$C = IX$	Formula 2.
Flat + Incremental Fee	$C = F + I_1X$	Formula 3.
Incremental With Steps	$C = I_1X_1 + I_2X_2 + I_3X_3 + \dots$	Formula 4.

Table 3. Provider Formulas

2. Incremental Fee

An incremental fee-based system could be set up any number of different ways. Figure 2 shows a system where DecisionNet would pay a set amount to the provider for each access of his software. Figure 3 shows a system where DecisionNet would pay a set amount to the provider for each access within a given range of accesses. There would be several fees involved, each covering a different range. Presumably, DecisionNet would pay the provider a lesser amount for each access in the next range, and so on. These two types of incremental payment systems are mathematically represented in the following formulas.

$$C = IX$$

Formula 2. Incremental Fee

C = Total cost incurred by DecisionNet for the provider's software over T.
I = Incremental fee per access.
X = Number of accesses.

$$C = I_1X_1 + I_2X_2 + I_3X_3 + \dots$$

Formula 3. Incremental Fee With Steps

C = Total cost incurred by DecisionNet for the provider's software over T.
 I_1, I_2, I_3, \dots = Incremental fees possible for a given range.
 X_1, X_2, X_3, \dots = Set range of accesses.

In this type of payment system the outlay to the provider varies with volume sales and could easily be attributed to one specific user or user's transaction. Therefore, the cost associated with the providers software should be considered in the marginal cost estimation of DecisionNet's services. The incentive for the provider, here, would be through volume usage and continuous revenues or royalties received from DecisionNet for his product. In an incremental fee type contract most of the risk lies with the provider of the software.

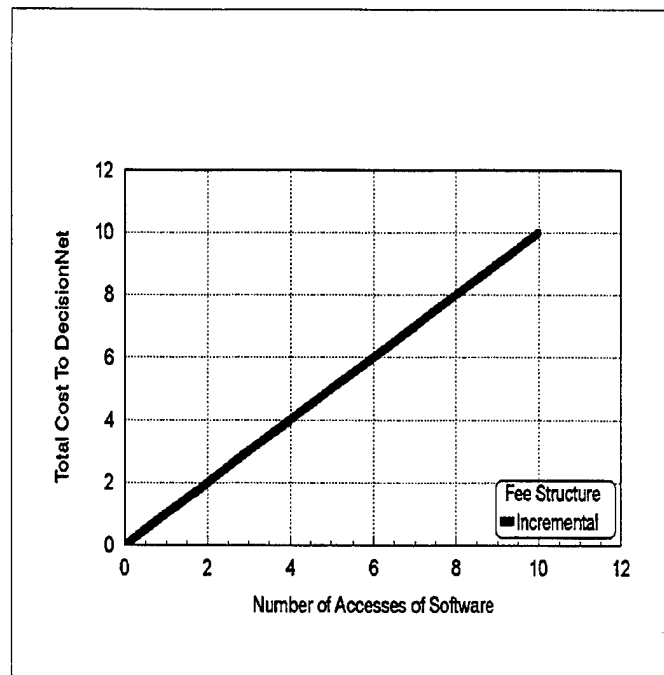


Figure 2. Incremental Fee

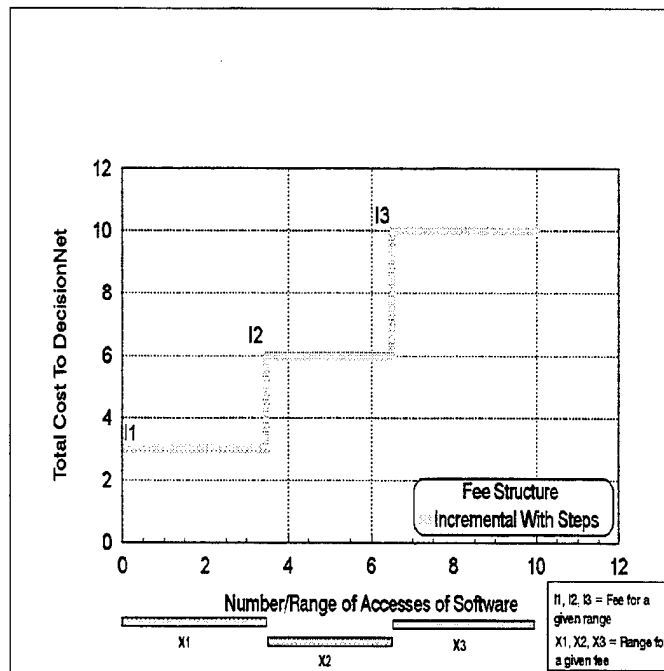


Figure 3. Stepped Incremental Fee

3. Mixed Fee Structure

This is the most probable type of payment plan to reimburse the provider for his software. In this method the risk is more evenly distributed between the provider and DecisionNet. A flat fee would be paid to the provider to secure the use of the software and subsequent usage fees would be paid monthly according to the number of accesses of the software. Since both a fixed and variable fee will be paid DecisionNet will need to recover these costs in two ways. The variable costs can be easily charged to the user as part of his session fee. The fixed cost portion would need to be recouped over time as part of membership fees or out of the funds accumulated from the difference in the actual session costs and the fee charged. Figure 4 graphically depicts a mixed fee structure. This figure would differ if the incremental portion varied given the range of accesses.

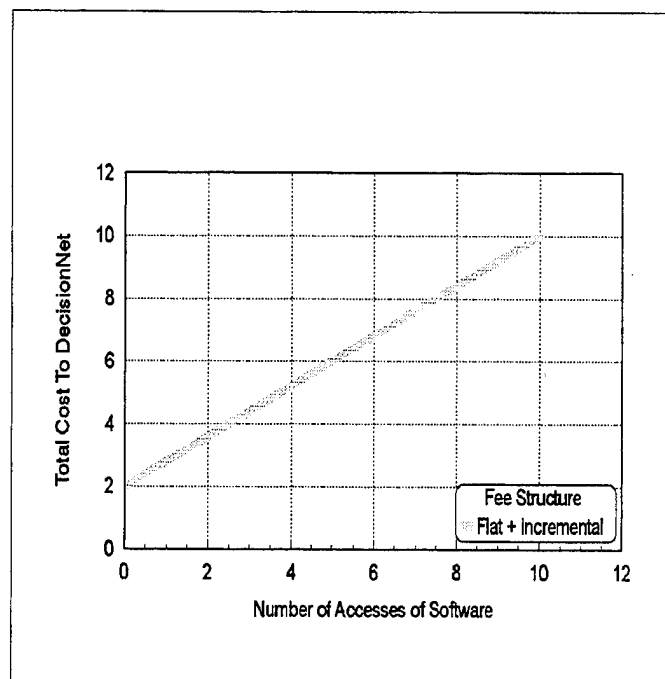


Figure 4. Mixed Fee Structure.

Formula 4 provides the mathematical representation of a mixed fee structure. This formula could easily be modified if the usage fees vary given the number of accesses.

$$C = F + IX$$

Formula 4. Mixed Fee Structure.

C	= Total cost incurred by DecisionNet for the provider's software over T.
F	= Flat Rate.
I	= Incremental fee per access.
X	= Number of accesses.

C. MARKET SEGMENTATION

Market segmentation should be an important part of DecisionNet's pricing strategy. The ability to segment a marketplace and eventually segment prices will help DecisionNet to cover its high fixed or sunk costs. DecisionNet must be able to do two things in order to segment prices effectively: First, it must be able to identify market segments that differ with respect to their price elasticity of demand. Second, it must be possible to enforce the different prices paid by the different segments. (Samuelson, 1992) The second half refers to preventing the different segments from crossing over and buying in the lower priced market area.

I anticipate that DecisionNet's market can be segmented into four parts, with each part possibly being subdivided into three sub-parts. The four sectors will be academic, corporate, government, and individual home users. The sub-parts or classes in each sector will be high, medium and low volume users. DecisionNet should price its services to maximize its profit in each sector and with each volume of user. I propose that the only way to get an approximate estimate of the price elasticity of demand for each sector will be to conduct a market survey.

The method I propose to limit crossover includes a combination of the honor system, service bundling and time of day discounts, and the monitoring of who is actually paying the bill.

Once this has been accomplished, DecisionNet can set the prices for the different sectors. DecisionNet will need to apply the markup rule to each sector and class

independently of one another to determine its optimal price and sales for each market segment. DecisionNet can then charge higher prices to the less price-sensitive buyers, while it attracts the more price-sensitive customer by offering them a discounted price.

In an attempt to segment prices effectively I have mentioned that the customer base should be segmented by buyer identification, and purchase quantity. I also mentioned that the use of time of purchase and service bundling will play a part in the pricing strategy. Time of purchase will also assist in leveling the volume of usage of the system helping minimize congestion down the road as volume increases. Service bundling can be used to combine multiple pieces of software and on-line assistance together at a lower price to the user.

D. COST RECOVERY ASSUMPTIONS SCHEMES

The cost recovery/pricing schemes suggested in sections F and G use the following assumptions developed in this thesis.

- The company seeks to maximize long term profit.
- The company will not recoup all its investment in the first year of operation. Full cost recovery may take several.
- The idea behind DecisionNet is sound, has profit potential and is economically feasible.
- DecisionNet will pursue further study in the following areas: the systems estimated cost, the demand curves of users, and the volume of usage.
- The pricing scheme develop will be designed specifically for charging consumers for the use of the model, solver, data and/or decision support packages for solving problems. The additional two potential uses (awareness/advertizing and evaluation/trial runs) are not specifically addressed. However, the research in this thesis will assist the price-setters at DecisionNet in pricing those two types of service.

- The price-setter needs to consider the marginal costs, the demand elasticities of the user groups, the prices charged by competitors, the value that the product will provide to the potential user, the demand intensity, and the customers' psychology when determining *short term* prices.
- The price-setter needs to consider the full cost (both fixed and variable) of the system in addition to the items mentioned in the previous assumption when establishing *long term* prices. This is necessary to ensure that the company recovers the total costs plus a satisfactory return for the investors.
- Any price charged should not exceed a user's willingness to pay, if it does the business will shutdown.
- Any pricing scheme or cost recovery method will need to be equitable to the different user groups, simple to understand, and easy to recreate.
- When a perspective user combines the prices charged, quality of service, reliability of service, and variety of software available on DecisionNet's system to that of other company's, that user should reach only one conclusion, choose DecisionNet.
- The price charged for services offered by DecisionNet will be less than \$2,500. This will greatly simplify the contracting process with the United States Government.

E. COST RECOVERY SCHEMES

DecisionNet is similar to the electronic publishing industry and the on-line information service provider industry. Most of the costs associated with DecisionNet occur before providing the first customer service, and are for all practical purposes considered sunk. The actual marginal or incremental costs maybe vary close to zero. The largest share of variable costs associated with a session will involve fees for the software's use and the amount of on-line assistance that the user requires. Management should

attempt to push sales to the point where there is no more additional revenue to be had in industries which have low variable costs. The point is generally where marginal revenue equals zero. (Samuelson, 1992)

The following schemes will attempt to recover DecisionNet's costs. These schemes will be broken down into a "parent" category called general pricing policies which will cover all of the pricing policies which will be the same throughout all user groups. The next four "child" categories will list the policies which are specific to a particular user group (academic, corporate, government, and individual home users).

- General Pricing Policies (Parent)
 - *Membership fee:* All users will be given the option to become a member. The membership fee will be assessed annually. This fee will be used to offset the large sunk costs incurred by DecisionNet. The actual fee will vary depending on which user group the member has selected, numbers of users on the account, and the anticipated volume of their usage. The benefit of becoming a member will be a percentage discount in the incremental charge assessed for each user session.
 - *Time of Day Discount:* To help control congestion, a time of day discount will be offered to all users. The times that will apply will depend on the volume of anticipated usage and will probably be adjusted regularly.
 - *Service Bundling:* All services can be purchased independently of one another. Bulk discounts will apply if multiple services are required. For instance if a user anticipates requiring research data, models and on-line help, then the three can be purchased for a discounted fee. The discount will come from only charging the user once for the shared portion and then adding up the incremental

costs of all the services. A discount percentage will be applied to the fees for all three services.

- *Nonmembers:* Are always welcome, and may actually be a cost-effective way of using the service if the user only anticipates needing DecisionNet's service once or twice. However, the usage fees charged to nonmembers will be higher than those charged to members, because the member's discount percentage will not apply. Nonmembers will be able to receive the time of day discounts and the service bundle discounts.
- Academic:
 - *Numbers of users:* A university can establish group or individual accounts for the university or for each individual college and library on campus. The membership fee will depend on the number of users that will have access to the account and their anticipated volume of usage. For example, there could be one fee for 0-25 users, another for 26-50 users, and so on. One university may have several different accounts with DecisionNet.
- Corporate:
 - *Numbers of users:* A corporation can be set up very similarly to the example mentioned in the university case. The difference in the amounts that each group will pay will be based on the markup applied. The markup will be based on the user groups' estimated demand curve and the desired rate of return.
- Government:
 - *Multiple Award Service (MAS) Contract:* As mentioned in Chapter II and amplified in Appendix A, if DecisionNet enters into a MAS contract with the United States Government it can save a considerable amount of time and energy in the contracting process. In fact, that savings will be noticed by both the user's command or

agency and DecisionNet. In the long term, that should greatly enhance the attractiveness of the service to the United States Government CO's and PM's. I recommended that a flat rate contract for service be entered into by DecisionNet. That rate can be set to account for the estimated type of service that the user will require (software required, time of usage, volume of usage, and number of users). This type of arrangement will be beneficial to the United States Government in two ways. (1) It will know exactly how much the service will cost (greatly simplifying its budgeting process). (2) The risk will be covered by DecisionNet. These contracts should be limited to one year, with very simple procedures in place to renegotiate and to renew. If DecisionNet underestimated one of the variables for the first year contract adjustments could be made in the next.

- Individual (Home user): This should prove to be the most price sensitive of the user groups. Here we need to attempt to make the service fees as inexpensive as possible and to price as close to the marginal cost as we can. This technique should help to make the service available to this user group and more effectively use DecisionNet's service capacity while still generating a profit.

F. INTRODUCTORY PRICING

DecisionNet will need to be extremely careful when setting the initial prices for its services. Once a price is established, it will be very difficult for DecisionNet to raise it (Nagle, 1987). I suggest that DecisionNet set a high price for its services. This high price may initially scare off a large portion of its potential customer base. To avoid this I recommend that DecisionNet offer an introductory discount off its suggested retail price for all its services. The customers should be made aware that the discount will be in

addition to any discount mentioned in the previous section and that this discount will only apply for a specified length of time beginning with their first access (this time frame will need to be decided by management). This policy should apply to all first time customers.

G. PROPOSED PRICING FORMULA FOR DECISIONNET

The proposed pricing policies or schemes for the academic, corporate, and individual home users can be expressed as in three simple formulas. This section, specifically Table 4, will define the variables involved in the formulas. The formulas are represented in Table 5.

A formula has not been designed for the United States Government user group due to the complexity of the ADPE contracting procedures. I recommend that prices be set up on a contract by contract basis through the preestablished MAS contract. If the ADPE purchasing procedures are simplified, the following formulas would also apply to the United States Government.

Variables	
D	Discounts that apply Types of discounts 1= Bundling of service discount 2= Membership discount 3= Time of day discount
E	Price elasticity of demand for the appropriate user group
F	Portion of fixed cost that we wish to recover
f, g, h	Mathematical expression of a function
I	Incremental cost of the transaction
M_{TU}	Annual membership fees
MUP_{TU}	Percentage markup for each user group
N	Number of users
ROI	Desired rate of return on investment
SP_{TU}	Session price, the incremental price for the session
T	Time of day discount
TU	Type user group Type user group options: A = Academic Group C = Corporate Group H = Home Group
U	User's selection to become a member or not Numbers to be substituted for U 0 = Nonmember 1 = Member
V	Estimated volume of usage Volume breakdown: 1 = High 2 = Medium 3 = Low

Table 4. Variables for User Group Formulas

Formulas		
Membership Fee	$M_{TU} = f(F, MUP, N, V) U$	Formula 4.
Session Usage Fee	$SP_{TU} = g(D, I, MUP)$	Formula 5.
Percentage Markup	$MUP_{TU} = h(E, ROI)$	Formula 6.

Table 5. User Group Formulas

Formula 4 describes how the membership fee will be determine for each user (M_{TU}). The membership fee for the user will be a function (f, g, h) of the fixed costs (F) incurred by DecisionNet, the markup percentage for the users group (MUP), the number of users who can gain access via this membership (N), whether or not membership is requested (U), and the anticipated volume of usage for this membership (V).

$$M_{TU} = f(F, MUP, N, V) U$$

Formula 4. Membership Fee

Formula 5 describes how the session usage fee will be determined for each user (SP_{TU}). This fee will be a function of the discounts that apply (D), the incremental costs of the transaction (I), the markup percentage that applies to the user's group (MUP).

$$SP_{TU} = h(D, I, MUP)$$

Formula 5. Session Usage Fee

Formula 6 describes how the percentage markup for each user group will be determined (MUP_{TU}). This markup will be a function of the user group's price elasticity of demand (E) and the rate of return on investment that the company wishes to receive (ROI).

$$MUP_{TU} = g(E, ROI)$$

Formula 6. Percentage Markup

H. CONCLUSION

The pricing policies proposed in this chapter have been developed by evaluating the theory behind pricing. In addition to the theory, proven aspects from different pricing schemes have been taken from industries that face similar markets or are considered to be models for specific pricing strategies. Together they have helped to form a flexible pricing scheme for DecisionNet. It has been designed to fit within the constraints of the assumptions mentioned in this chapter and yet to be general enough in nature that it can fit a variety of scenarios. This scheme will however need to be reevaluated if the assumptions made in this thesis change.

The final chapter of this thesis will address areas in which further research is needed. It will also summarize some key points and lessons learned in the process.

VI. CONCLUSIONS

A. SUMMARY OF CHAPTERS

This thesis attempts to address on-line information service pricing to assist companies (that provide on-line information services) in their future management, operations, and planning. The second chapter addressed the potential contributions that those service providers can provide the United States Government and the steps that can be taken to simplify the contracting process with the government.

Chapter III began by taking a theoretical look at pricing. It was discovered that are several different academic and professional groups that are actively involved in determining service costs and pricing. Three groups were selected (accounting, economics, and marketing), and their approaches were discussed. This chapter was concluded by applying portions of each group's viewpoints to DecisionNet. Chapter IV addressed the pricing issue from the perspective of business, specifically what types of pricing methods or cost recovery methods are currently being used or will be used in the future. This approach was required due to the nature of the services that on-line information service providers like DecisionNet will be offering (rental of on-line software). For the most part the costs associated with DecisionNet's services will be fixed. This chapter looked at several business sectors that had similar cost constraints. It also discussed industries that can be considered models for different pricing strategies.

Chapter V brought together all the assumptions made throughout this thesis and the pricing strategies thought to apply to DecisionNet. This chapter suggested schemes for reimbursing the providers of the software, segmenting DecisionNet's marketplace, and pricing its services. These schemes were also presented as general formulas that could be applied in the future. Finally a recommendation was made with regards to how DecisionNet should initially set the prices of the services. It was recommended that the entity start with a higher price but offer introductory discounts as incentives to get customers to try the service. Three appendices have been included to address the United

States Government's acquisition process as it pertained to DecisionNet. Again this is necessary so that companies that conduct business with the United States Government are aware of the idiosyncrasies of the process.

B. CONTRIBUTION

This thesis has provided some insight that companies can use when pricing their services. Initial research discovered points that any company can use to reduce the amount of work that will be required to enter into a contract with the United States Government. The thesis has also brought together three different fields that address pricing pointing out some of the strengths and weaknesses in each of their arguments. It has also showed how the pricing theory is being used in industry. At a minimum, it offers on-line information service providers' price-setters a basic understanding of the many variables that go into the pricing of services. It also provides an understanding of the complexity of the United States Government's acquisition process. This information will greatly assist the price-setter and government sales representative in his dealings with any the United States Government contracting officer. In the end, this thesis provides information that most companies could use to assist in their pricing decisions.

C. LESSONS LEARNED IN THE PROCESS

Several lessons have been learned in the research and writing of this thesis. Initially, the scope selected was too large. It was decided early that it would be best thoroughly to address a few questions and issues vice superficially addressing a broader range of questions. The next lesson dealt with what was most practical for this thesis. A specific pricing structure would not apply to all applications. As a result, it was decided that the formulas and costs to be discussed in the thesis would be written in as general a form as possible. This will provide the price-setters and decision makers more flexibility in the future. The final lesson learned dealt with assumptions. Many assumptions were

necessary to narrow the scope further and to give more direction. I felt that it was important to agree early on as to what assumptions were to be made and to write them down.

D. AREAS OF FURTHER RESEARCH

This thesis has brought up several areas that need further research. These areas are specific to DecisionNet but could be used by any company that is being developed.

- The decision makers need to develop a non-restricting vision statement and an appropriate mission statement.
- A market survey needs to be conducted to help determine the elasticity demand functions for the prospective consumers and their expected volume of usage. It can also be used to determine if the marketplace can be effectively segmented.
- What will be the actual costs associated with this system?
- How much is the user willing to pay for the services offered by DecisionNet?
- What other types of software should DecisionNet make available on-line?
- Are the government acquisition procedures for ADPE relevant in today's environment?

E. CONCLUSION

Service pricing over the Internet is still in its infancy. As a result there is not one set model for pricing Internet services that directly applies to applications like DecisionNet. The strategy for determining DecisionNet's robust pricing scheme has taken this into account. I feel that one needs to have a good understanding of pricing theory to price a service effectively. With this understanding one can look at what is currently being

done to price other products and services and determine what can be transferred to a pricing strategy for any company. This thesis has taken this approach.

APPENDIX A. AN OVERVIEW OF GOVERNMENTAL CONTRACTING FOR AUTOMATED DATA PROCESSING EQUIPMENT

This appendix has been included to give the reader insight into the complexity of the United States Government's acquisition process for automated data processing equipment (ADPE).

A. LEGISLATIVE AND REGULATORY REQUIREMENTS

A substantial amount of legislation, regulation, and directives has been developed to address the federal acquisition of ADPE. Those documents and the bureaucracy built up around them have been designed to protect the interests of the government and the taxpayers. (Willis, 1994)

ADPE has been defined in the Federal Information Resources Management Regulation (FIRMR) as "any equipment or interconnected system of subsystems of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information . . . [] . . . such terms includes (i) computers, (ii) ancillary equipment, (iii) software, firmware, and similar procedures, (iv) services including support services, and (v) related resources as defined by regulations issued by the Administrator for General Services." (FIRMR, 1994) As a result of this nearly all-inclusive definition, the services offered by DecisionNet are included under the rules that apply to all other ADPE acquisitions for the United States Government.

Those who contract with or for the United States Government should be familiar with the following documents and organizations:

- The Brooks Act (P.L. 89-306),
- Warner Amendment (P.L. 97-86, P.L. 99-500)
- Paperwork Reduction Act of 1980 (P.L. 96-511)
- Paperwork Reduction Reauthorization Act of 1986 (P.L. 99-500)
- The Competition in Contracting Act (CICA)(P.L. 98-369),
- Computer Security of 1987 (P.L. 100-235)
- Privacy Act of 1974 (P.L. 93-579)
- Copyrights (17 U.S.C. Section 101 et seq.)
- Trade Agreements Act of 1979 (P.L. 93-596)
- Patent and Trademark Laws (35 U.S.C.)
- Federal Acquisition Regulation (FAR)
- Federal Information Resources Management Regulation (FIRMR)
- Contracted Advisory and Assistance Services (CAAS).
- Office of Management and Budget (OMB) Circular A-130
- General Services Administration (GSA)
- Office of Management and Budget (OMB)
- National Institute of Standards and Technology (NIST)
- Federal Information Processing Standards (FIPS)

- General Services Board of Contract Appeals (GSBCA)
- General Accounting Office (GAO)

Explanations of these laws, regulations, directives and organizations can be found in Appendix B.

B. INFORMATION RESOURCES ACQUISITION PROCESS

Information resources (IR) acquisition involves four distinct phases. They are called planning, acquisition, implementation, and operations and maintenance. (GSA Overview Guide, 1990; Arnavas, 1994) Figure 5 shows the order of the four phases (left to right) and the major steps involved in each phase (top to bottom). The actual steps involved during each phase will vary depending on the specific type of acquisition sought, how much negotiation is required, and the dollar amount of the acquisition. The GSA has published an overview guide that addresses the acquisition process. The following sections discuss the first two steps of the IR acquisition process. They have been summarized from the GSA Overview (1990) as well as from Arnavas's book titled *Government Contracting Guidebook* (1994) and notes from Mark Stone's ADPE Acquisition class at Naval Postgraduate School (1995).

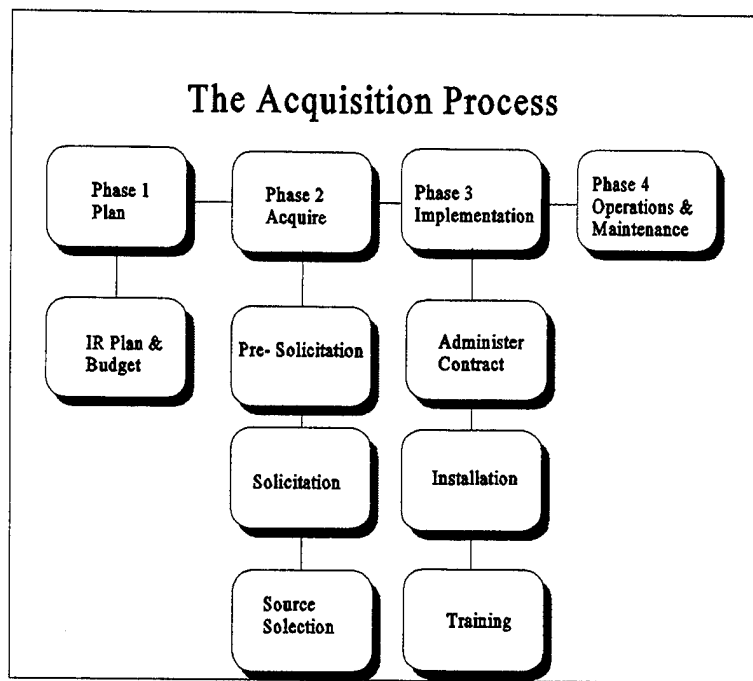


Figure 5. The Acquisition Process

1. Planning

The planning phase is critical to the success of an acquisition. This section has been broken down into the three parts, the players and their responsibilities, the description of the planning phase, and the dollar thresholds involved in the acquisition process.

a. *The Players and Their Responsibilities*

The program manager (PM) is responsible for the execution of this phase. The PM ensures that the long-term and short-term needs are met during the acquisition process. He establishes the need for the system or service, details the requirements, determines the acquisition plan, estimates the costs, ensures that the project gets budgeted, and completes the market survey. (GSA Overview, 1990)

The PM works closely with the contracting officer (CO) and should request assistance from the CO as early in the process as necessary. At a minimum, the PM should enlist the CO's assistance in performing the following pre-solicitation tasks:

- preparing an acquisition plan,
- requesting a delegation of procurement authority (DPA) from GSA,
- conducting a market survey, and
- preparing justification for other than full and open competition (if needed).

The CO is responsible for all aspects of an actual contract. This includes monitoring the contractor's progress against costs, inspecting and accepting deliverables, exercising contract options, and modifying or terminating the contract. He must ensure that the award of an IR contract is within the limits of his warrant and that he is authorized by a GSA DPA. (GSA Overview, 1990)

b. *IR Planning and Budgeting*

An acquisition plan is written from a broad perspective. It deals with the entire acquisition life cycle, including all of its individual contracts. The plan lays out formal milestones and addresses each step in the life cycle. There are three documents that place specific requirements on the planning phase. They are called the Paperwork Reduction Act of 1980, the OMB Circular A-130, and the OMB Circular A-11. The first requires all executive agencies to develop and annually to revise their five-year plan for meeting their IR needs. The second requires all executive agencies to establish a multi-year strategic planning process for the acquiring and operating of information technology. The third requires that all executive agencies prepare and submit an annual agency-wide budget, which includes the IR budget and management issues. (GSA Overview, 1990)

The lead time for determining an organization's IR budget requirements is normally two years. This is due partially to the budgeting process of the United States Government. An agency must have identified the general IR requirements that will be met in each fiscal year, the alternatives for meeting those requirements, and the approximate

cost of the solutions. Once those targeted funds are approved for use by the agency, the CO can begin the first part of the acquisition phase called pre-solicitation. The targeted funds then become part of the Presidents budget. These funds are still subject to being cut during the budget submission and approval process. The project's funds can come from different pots or colors of money. Any acquisition of ADPE that is less then \$50,000 will come out of an agency's Operations and Maintenance Fund. Any acquisition that is greater then \$50,000 will come out of their Other Procurement Fund. (Practical Comptroller, 1995)

c. *Thresholds*

The steps required to complete each phase of the acquisition process can vary depending on several factors. The first factor to be addressed is the estimated cost of the procurement. The estimated cost of the procurement has the largest impact.

The use of the Internet and the push toward electronic commerce and electronic data interchange (EC/EDI) has had an effect on the thresholds. One of the effects was the establishment of Federal Acquisition Network (FACNET). A summary what FACNET is designed to accomplished can be found in Appendix B. If an agency is FACNET certified only the solicitations for procurements estimated to exceed \$100,000 are required to be published in the Commerce Business Daily (CBD). The solicitations for procurements that are less than \$100,000 but greater than \$25,000 must be made available on-line. Once the entire federal government becomes certified, this threshold will be raised to \$250,000.

The next threshold is \$50,000, this amount relates to agencies that are not FACNET certified. These agencies must publish the solicitation in CBD. Here the contracting officer must address small business set-asides and the Brooks act. The last dollar threshold is \$2,500 to \$0.00. Procurements that are within this range fall under the "prudent competition" rules. There is not a requirement for small business set-asides in this dollar range, however; the Brooks Act still applies. DecisionNet estimates that most

of its contracts with the United States Government will fall in the \$2,500 to \$0 range. (Bhargava, 1995)

2. Acquisition Phase

The acquisition phase includes the pre-solicitation, the solicitation, and the source selection. (GSA Overview, 1990) The following sections have been included to give the reader an overview of the steps completed during each phase. The scope has been limited to include only those steps required for an acquisition in the \$0 to \$2,500 range.

a. *Pre-solicitation*

The pre-solicitation phase includes refining the organization's needs, identifying a reasonable number of alternatives to fill the need, completing a requirements statement, and ensuring that the need complies with DoD Directive 4205.2 (CAAS). Both the PM and the CO are involved in this phase. The purpose of requirements analysis is to detect and document the agency's need for resources. An analysis of alternatives should be completed for each identified requirement. Its purpose is to compare and evaluate the costs and benefits of various alternatives for meeting the requirements and to determine which alternative is most advantageous to the United States Government. This will help to narrow down the type of solicitation that will best fit the acquisition. The PM is also required to ensure that the need complies with the CAAS directive (DoD only). This directive identifies the types of consulting services that can be acquired outside of government sources.

A variety of sources can fulfill United States Government's IR requirements. These include existing United States Government sources, established commercial sources, small purchase procedures, and contracting out. Acquisitions from United States Government sources are the preferred methods for fulfilling IR requirements. The United States Government has several commercial sources for IR. GSA has established

mandatory (requirements contracts) and non-mandatory (schedule contracts) sources for IR equipment, software, and services. Small purchases' procedure is an open market procedure used to acquire goods and services when anticipated costs will not exceed \$25,000. By regulation, small purchase acquisitions are reserved for small businesses, unless CO determines that it is not reasonable to expect sufficient number of bids from small businesses. (GSA Overview, 1990)

b. *Solicitation*

The solicitation process can take one of two different paths. That path is determined by the CO's selection of the procurement process. He can select a sealed bid procurement or a competitive negotiation procurement. (GSA Overview, 1990; Arnavas, 1994) The CO will generally select the sealed bid method for procurements when the procurement is not driven by specifications, if the time permits, if the decision will be made on basis of price, if there is a reasonable expectation of receiving more than one bid, and it is not necessary to conduct negotiations with the responding offerors. The CO will generally select the competitive negotiated procurement method when the procurement is driven by specifications. (Stone, 1995)

c. *Source Selection*

The source selection process is also dependent on the selection made by the CO earlier in the acquisition process. If the CO had chosen the sealed bid approach the source selection or contract awarding is simple, the CO awards the contract to the lowest priced, responsive, responsible offeror. If the CO had chosen the competitive negotiation approach, the source selection would be based on either the lowest priced, responsive, responsible offeror or the best value to the United States Government. The best value to the United States Government enables the CO to look at what is being

offered by the contractor and then to decide which contract is offering the “best value” service.

For negotiated contracts, the Source Selection Plan (SSP) explains how the proposals will be solicited and evaluated. The PM is responsible for establishing the technical requirements. The CO is responsible for all contractual actions relating to the source selection process. (Arnavas, 1994) The steps involved in the source selection process for a competitive negotiation are listed below:

- source Selection Evaluation Board (SSEB) orientation,
- establishment of procedures to protect proposals from unauthorized disclosure,
- technical and cost evaluation of proposals,
- clarification of requests and deficiency notices,
- awards based on initial offers (if conditions merit),
- determination of the competitive range,
- discussions with offerors in the competitive range,
- performance and capability validation,
- best and final offers (BAFO's),
- selection and award,
- notification of unsuccessful offerors, and
- debriefing of unsuccessful offerors. (GSA Overview, 1990)

C. CONTRACT TYPES

Contract types are grouped into two broad categories: fixed price and cost reimbursement. (Arnavas, 1994) Fixed price contracts involve purchases of a service (rather than a level of effort). They place the least cost risk on United States Government, and they also impose the least administrative burden. Fixed price contracts have known budgetary impact, and they promote price competition. Cost reimbursement contracts are used when uncertainties of performance cannot be estimated. The key element in every cost reimbursement contract is that contractor is required, as a condition of payment, to provide a best level of effort to complete the work called for in the specifications and Statement of Work. Under these types of contracts the United States Government takes

all the cost risks of performance. The contractor takes no more than a minor risk and is generally guaranteed a profit. (Stone, 1995)

The United States Government can enter several different types of contracts. The following is a list of those contracts.

- Firm Fixed Price (FFP)
- Firm Fixed Price with Economic Adjustment (FPE)
- Firm Fixed Price Plus Incentive (FPPI),
- Firm Fixed Price Plus Award Fee (FPAF),
- Cost Plus Award Fee (CPAF)
- Cost Plus Incentive Fee (CPIF)
- Cost Plus Fixed Adjustment Fee (CPEF)
- Cost Plus Fixed Fee (CPFF) (Arnavas, 1994)

Figure 6 shows how the risk borne by the United States Government varies depending on the type of contract. The contract on the left places most of the risk in the hands of the vendor. The risk to the vendor decreases as one proceeds to the contract on the far right. The contract on the far right places most of the risk in the hands of the United States Government. The different types of contracts are further explained in Appendix C.

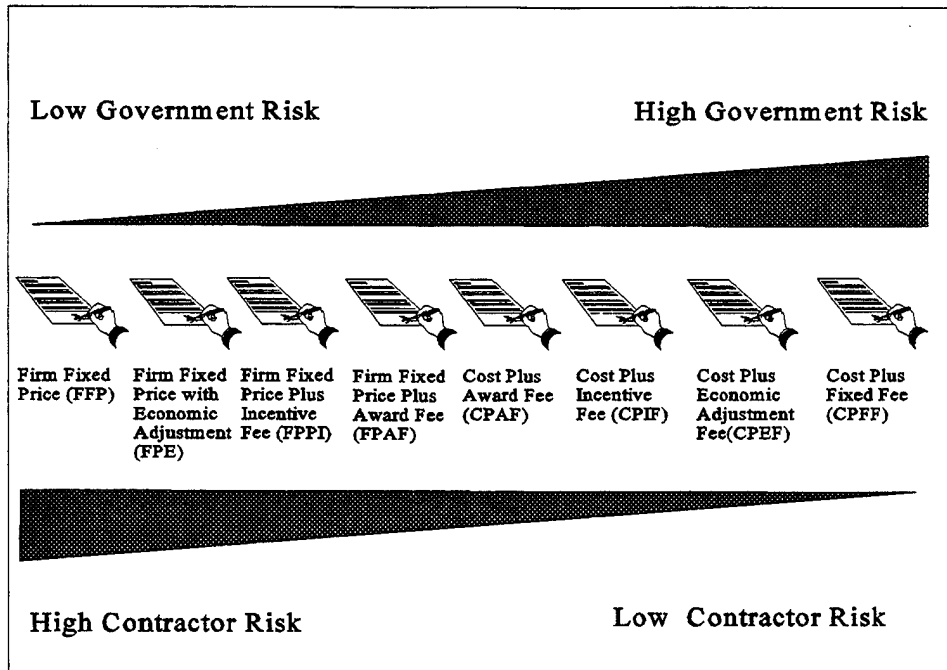


Figure 6. Degree of Risk Borne by the United States Government and the Contractors

D. PROTEST

The final section of this appendix addresses the protest process. The CO and the PM must be aware of the possibility of a protest from one or more of the bidders. (Kircher, 1988) Protests are written objections by an interested party to a solicitation, a proposed award, or an award of a contract. Protests are usually filed at one of three times: when the bids are due (to protest the specification), after the bids are received (to protest elimination from consideration for the award), or after the award is made (to protest not receiving the award). The possibility of a protest should be addressed and planned from the beginning of the process. The bidder can file a protest with U.S. Claims Court prior to the award of a contract. He can file a protest with CO until the award of the contract. He can also file a protest with the GAO up to ten days after the award of a contract.

APPENDIX B. LEGISLATION, REGULATIONS, DIRECTIVES AND OVERSIGHT ORGANIZATIONS

This appendix is an excerpt from a GSA document titled "A Guide for Using GSA's Schedule Contracts for FIP Resources." The Federal acquisition process is a highly regulated activity, affected by numerous public laws, regulations and directives. The interest of the taxpayers and government are protected by this regulatory framework.

A. LEGISLATION

A number of Federal laws affect the acquisition of Federal information processing (FIP) resources. These include, but are not limited to, the Brooks Act, the Warner Amendment, the Paperwork Reduction Act (and its reauthorization), the Competition in Contracting Act, the Computer Security Act, the Copyright Act, the Privacy Act, the Trade Secrets Act, and the Patent and Trademark laws.

1. The Brooks Act (P.L. 89-306)

The Brooks Act, enacted in 1965, established the basic policy for the management of ADPE. Public Law 99-500, the Paperwork Reduction Reauthorization Act of 1986, expanded and clarified the scope of the Brooks Act to include telecommunications resources, software, and computer-related services such as computer service bureaus and contract programming. The Brooks Act granted specific authority and responsibility to the General Services Administration, the Office of Management and Budget (OMB), and the Department of Commerce (DOC).

2. Warner Amendment (P.L. 97-86, P.L. 99-500)

The Warner Amendment, enacted in 1981, exempted the Department of Defense (DoD) from the Brooks Act for certain DoD procurements of ADP equipment and service. The Brooks Act, as amended by Public Law 99-500 in 1986, contained the same exemption.

3. Paperwork Reduction Act of 1980 (P.L. 96-511)

In 1980 the Paperwork Reduction Act was enacted, in part, to ensure that both ADP and telecommunications technologies were acquired and used to achieve clearly stated objectives. These were to improve service delivery and program management, to increase productivity, and to reduce fraud, waste, and, where possible, the reporting burden. OMB's Office of Information and Regulatory Affairs has overall authority for implementation of the Act and has defined paperwork reduction requirements in OMB Circular A-130.

4. Paperwork Reduction Reauthorization Act of 1986 (P.L. 99-500)

The Paperwork Reduction Reauthorization Act significantly expanded the Brooks Act definition of automatic data processing equipment to reflect the merging of automatic data processing, communications, and related technologies. The law defined ADPE as any equipment or interconnected system or subsystems of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information. This includes:

- *computers;*
- *ancillary equipment;*
- *software, firmware, and similar procedures;*
- *services, including support services; and*

- *related resources as defined by regulations issued by GSA.*
- *The Competition in Contracting Act (P.L. 98-369)*

The Competition in Contracting Act (CICA), enacted in 1984, mandated a policy of full and open competition. It required collection of market research data before preparing a solicitation. In addition, CICA requires the submission of cost and pricing data in certain procurements, prior to award. CICA also required that proposals be evaluated only on factors included in a solicitation.

CICA provided exceptions to the use of full and open competition (See FAR Part 6). CICA also reinforced the Government's policy to place a fair proportion of its acquisitions, including contracts and subcontracts, with small businesses and small disadvantaged businesses.

CICA provided that if agencies follow the procedures established by GSA for use of the multiple award schedule program an acquisition may be considered to be conducted under full and open competition if participation has been open to all responsible sources and orders/contracts result in the lowest overall cost alternative to meet the needs of the Government.

5. Computer Security Act of 1987 (P.L. 100-235)

The Computer Security Act of 1987 amended several laws to add provisions relating to the security and privacy of sensitive information in Federal computer systems (e.g., hardware, software, and data). The Act assigned responsibility for the development of computer security guidelines and standards to the National Bureau of Standards now referred to as the National Institute of Standards and Technology (NIST). The Act also required agencies to identify systems that contain sensitive data and develop a security plan for each of them.

6. Privacy Act of 1974 (P.L. 93-579)

The Privacy Act of 1974 provided for the protection of information about individuals maintained in Federal record systems. It established specific criteria for maintaining the confidentiality of sensitive data and guidelines for determining which data are covered. According to the Act, Federal agencies and employees have certain responsibilities. One is to maintain the confidentiality of data covered by the Act. Another is to take actions necessary to ensure to a reasonable degree that data concerning individuals and maintained in Federal information systems are accurate.

OMB Circular A-130 implemented provisions of the Privacy Act. Another resource for assistance in complying with the Privacy Act is FIPS PUB 41, Computer Security Guidelines for Implementing the Privacy Act of 1974.

7. Copyrights (17 U.S.C. Section 101 et seq.)

In 1980 the copyright laws were amended to recognize the realities of modern data processing systems. Section 117 permitted copying of copyrighted computer programs for backup or archival purposes if a copy is required to use the program. Management must ensure that procedures are in place to prevent unauthorized use or duplication of copyrighted programs. These procedures must include appropriate disciplinary action.

8. Trade Agreements Act of 1979 (P.L. 93-596)

The Trade Agreements Act of 1979 applies to the purchase of "eligible products" from "designated countries or Caribbean Basin countries" when the estimated price is equal to or more than a dollar threshold established by the U.S. Trade Representative. This issue is not a concern for users of the MAS contracts since GSA satisfies the provisions of the Act during its negotiation.

9. Patent and Trademark Laws (35 USC)

When an application contains or uses patented software, users have the responsibility to protect the rights of the patent holder. Specifically, the user must ensure that the patented software is not improperly disclosed, used, or copied.

10. Federal Acquisition Streamlining Act of 1994

The Federal Acquisition Streamlining Act of 1994 establishes the Federal Acquisition Network (FACNET) requiring the Government to evolve its acquisition process from one driven by paperwork into an expedited process based on Electronic Data Interchange (DI). The electronic system is intended to provide a single face to industry and interoperability within the federal sector. The Act establishes parameters for FACNET built along functional lines, with parameters set forth for Government and private users. These functions are to be implemented by agencies within 5 years of enactment of the Act.

The Government-wide FACNET will be designed to:

- *inform the public about Federal contracting opportunities;*
- *outline the details of Government solicitations;*
- *permit electronic submission of bids and proposals;*
- *facilitate responses to questions about solicitations;*
- *enhance the quality of data available about the acquisition process; and*
- *be accessible to anyone with access to a personal computer and a modem." (DoD EC Office, 1994)*

B. REGULATIONS AND DIRECTIVES

Regulations and directives related to the acquisition of FIP resources include the FAR, the FIRMR, OMB Circulars, and agency-Specific guidance.

1. Federal Acquisition Regulation (FAR)

The FAR, established in 1984, is the primary regulation used by all Executive agencies for the acquisition of supplies and services with appropriated funds. The FAR consolidated the procurement regulations of GSA, DoD, and the National Aeronautics and Space Administration (NASA) into a single regulation providing for coordination, simplicity, and uniformity in the acquisition process. It contains general contracting rules that all agencies must follow. Authority for this consolidation came from the Office of Federal Procurement Policy (OFPP) Act of 1974, as amended by Public Law 96-83. Each agency may publish rules specific to that agency in supplemental agency regulations.

2. Federal Information Resources Management Regulation (FIRMR)

The FIRMR, established in 1984, contains rules in addition to those in the FAR governing the acquisition, management, and use of FIP resources and the creation, maintenance and use of records by Federal agencies. The FIRMR requires that information resources be acquired, managed, and used in a manner that improves service delivery and program management, increases productivity, reduces waste and fraud, and minimizes paperwork burdens. The FIRMR and FAR are used jointly in the acquisition of FIP resources. For acquisitions of FIP resources, the FIRMR relies on the FAR for general policies and procedures. The policies and procedures in FIRMR Part 201-39 are in addition to, not in lieu of, the FAR, except when the FIRMR specifically requires its policies and procedures, and not those of the FAR, to be followed. The FIRMR also requires Federal agencies not otherwise subject to the FAR to follow the FAR when acquiring FIP resources subject to the FIRMR.

3. Office of Management and Budget Circular A-130

OMB Circular A-130, Management of Federal Information Resources, contains consolidated policy for the management of FIP resources in Executive agencies. In addition, it assigns responsibilities to specific agencies and contains information regarding--

- Agency responsibilities for maintaining records about individuals;
- Cost accounting, cost recovery, and interagency sharing of information technology facilities; and
- Security of agency automated information systems.

4. Agency-specific Guidance

Some agencies are subject to special regulations or have internal directives concerning acquisition of FIP resources. When using the FIP MAS program, contact both the agency's contract and Information Resource Management (IRM) staff for agency-specific guidance.

C. OVERSIGHT ORGANIZATIONS

The following five Government organizations have primary authority for overseeing the acquisition of FIP resources.

1. General Services Administration

The Brooks Act directs GSA to coordinate and provide for the economic and efficient purchase, lease, and maintenance of automated data processing equipment by Federal agencies. GSA has exclusive authority to procure FIP resources with the power

to delegate procurement authority to Federal agencies to the extent GSA determines necessary or desirable.

The Brooks Act prohibits GSA from impairing or interfering with an agency's determination of its data processing requirements, including developing specifications and selecting types and configurations of equipment. GSA also cannot control an agency's use of the equipment. GSA issues and maintains changes to the FIRMR and conducts other acquisition activities such as issuing delegations of procurement authority (DPA's). GSA also issues and maintains the Federal ADP and Telecommunications Standards Index.

2. Office of Management and Budget

Under the Brooks Act, OMB is charged with fiscal control and the development of administrative and management policy for FIP resources. OMB has assigned the day-to-day management functions to GSA.

Under the Paperwork Reduction Act (and its reauthorization), OMB was granted broad authority concerning the planning, budgeting, organizing, directing, training, promoting, controlling, and other managerial activities involving the collection, use and dissemination of information.

3. National Institute of Standards and Technology (NIST)

NIST, formerly the National Bureau of Standards (NBS), is an agency of the Department of Commerce. Under the Brooks Act, NIST is responsible for providing scientific and technological services to agencies for ADPE and for developing and maintaining standards to maximize agencies' ability to share computer programs and data. The Federal Information Processing Standards (FIPS) generally called FIPS PUBS, are published by NIST to fulfill this purpose.

FIPS PUBS include standards, guidelines, and program information documents. They are classified into seven categories:

- General Publications
- Hardware Standards and Guidelines
- Software Standards and Guidelines
- Data Standards and Guidelines
- ADP Operations Standards and Guidelines
- Related Telecommunications Standards
- Conformance Tests

4. General Services Board of Contract Appeals (GSBCA)

The GSBCA is responsible for resolving disputes between contractors and Government agencies, including protests filed under the Competition in Contracting Act of 1984. The Board was established by the Contracts Disputes Act of 1978 (41 USC 601 et. seq.) as an independent tribunal, but functionally located within GSA. It can grant the same relief available in the US Claims Court. GSBCA hears most protest cases for FIP resources contracts.

5. General Accounting Office (GAO)

The Budget and Accounting Act of 1921 (31 USC Chapter 7) established the GAO to audit Government agencies independently. Over the years, Congress has expanded GAO's audit authority, added new responsibilities and duties, and strengthened its ability to perform independently.

GAO's fundamental responsibility is supporting Congress. To meet this objective, GAO performs a variety of services, the most prominent of which are audits and evaluations of Government programs and activities, including major FIP resources acquisitions. GAO, in addition to the GSBCA, is authorized to hear and decide protest cases.

APPENDIX C. FIXED AND VARIABLE CONTRACTS

This appendix is an excerpt from a GSA document titled "A Guide for Contracts for FIP Resources, Information Resources Management Services, U.S. General Services Administration." It summarizes the different types of fixed price and cost reimbursement contracts that the United States Government can enter.

A. FIXED PRICE CONTRACTS

Fixed-price types of contracts provide for a firm price or, in appropriate cases, an adjustable price. An adjustable price is subject to adjustment only by operation of contract clauses providing for equitable adjustment or other revision of the contract price under stated circumstances.

1. Firm-fixed-price

Provides for a price that is not subject to any adjustment on the basis of the contractor's cost experience in performing the contract. This contract type places upon the contractor maximum risk and full responsibility for all costs and resulting profit or loss. It provides maximum incentive for the contractor to control costs and perform effectively and imposes a minimum administrative burden upon the contracting parties.

2. FIXED-PRICE WITH ECONOMIC PRICE ADJUSTMENT

Provides for upward and downward revision of the stated contract price upon the occurrence of specified contingencies. Economic price adjustments are of three general types:

- Adjustments based on established prices
- Adjustments based on actual costs of labor or material
- Adjustments based on cost indexes of labor or material

3. Fixed-price Incentive

Provides for adjusting profit and establishing the final contract price by a formula based on the relationship of final negotiated total cost to total target cost. The final price is subject to a price ceiling.

4. Fixed-price with Prospective Price Redetermination

Provides for a firm fixed price for an initial period of contract deliveries or performance and prospective redetermination, at a stated time or times during performance, of the price for subsequent periods of performance.

5. Fixed-ceiling-price with Retroactive Price Redetermination

Provides for a fixed ceiling price and retroactive price redetermination within the ceiling after completion of the contract.

6. Firm-fixed-price, Level of Effort Term

Requires the contractor to provide a specified level of effort, over a stated period of time, on work that can be stated only in general terms and the Government to pay the contractor a fixed dollar amount. Payment is based on the effort expended rather than on the results achieved.

B. COST-REIMBURSEMENT CONTRACTS

Cost-reimbursement types of contracts provide for payment of allowable incurred costs, to the extent prescribed in the contract. These contracts establish an estimate of total cost for the purpose of obligating funds and establishing a ceiling that the contractor may not exceed (except at its own risk) without the approval of the contracting officer.

1. Cost

A cost-reimbursement contract in which the contractor receives no fee.

2. Cost-sharing

A cost-reimbursement contract in which the contractor receives no fee and is reimbursed only for an agreed-upon portion of its allowable costs. The contractor agrees to absorb a portion of the costs in the expectation of substantial compensating benefits.

3. Cost-plus-incentive-fee

Provides for an initially negotiated fee to be adjusted later by a formula based on the relationship of total allowable costs to total target costs.

4. Cost-plus-award-fee

Provides for a fee consisting of a base amount (which may be zero) fixed at inception of the contract and an award amount, based upon a judgmental evaluation by the Government, sufficient to provide motivation for excellence in contract performance.

5. Cost-plus-fixed-fee

Provides for payment to the contractor of a negotiated fee that is fixed at the inception of the contract. The fixed fee does not vary with actual cost, but may be adjusted as a result of changes in the work to be performed under the contract. A cost-plus-fixed-fee contract may take one of two basic forms -- completion or term:

- The completion form describes the scope of work by stating a definite goal or target and specifying an end product.
- The term form describes the scope of work in general terms and obligates the contractor to devote a specified level of effort for a stated time period.

Because of the differences in obligation assumed by the contractor, the completion form is preferred over the term form whenever the work, or specific milestones for the work, can be defined well enough to permit development of estimates within which the contractor can be expected to complete the work.

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